PEST CONTROL

MARCH 1957

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Mid-winter fog and grounded airlines didn't stop NPCA executive secretary, Dr. Ralph E. Heal from appearing at several industry conferences in January and February, but his bags fell behind on that leg of his trip which brought him to Purdue. The gay sport shirt he's wearing here, picked up in a hurried visit to a Lafayette men's shop, enabled him to carry on with a lecture on the latest in insect resistance to chemicals. See page 35 for his commentary given Purdue delegates at this year's meeting.

Monthly Magazine of Methods, Chemicals, and Equipment for Urban and Industrial Pest Control and Sanitation Since 1933

NEW research confirms CHLORDANE'S stability!

"Nineteen-year test" proves CHLORDANE is stable in alkaline soils!

THE FACTS ABOUT ALKALI STABILITY—Soils in many areas infested by termites are highly alkaline, and the "fill" around new homes often contains plaster scraps and other alkaline materials. Any insecticide adversely affected by alkalinity would, in many areas, quickly lose its effectiveness as a termite killer. Chlordane's alkali stability was established at the time of its introduction, ten years ago, and is one reason why more PCO's use Chlordane than any other insecticide. A test recently conducted in Velsicol's research laboratories brings out more vividly the extent of Chlordane's stability.

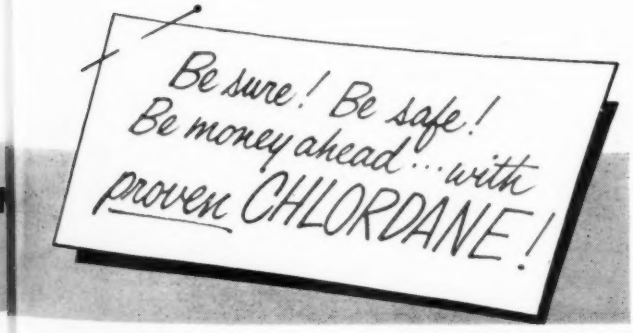
GUARD YOUR REPUTATION WITH CHLORDANE—Chlordane, by providing advantages proven over a 10 year period, enables you to give homeowners the lasting termite protection they seek. You'll find Chlordane is most economical, too! It has no offensive odor, it's safe to handle, easy to use with all types of equipment, provides longer hose life, and won't harm vegetation in its water emulsion form. In addition to being the No. 1 termite killer, as proven through research and field use, Chlordane is the most effective way to kill other common indoor and outdoor pests. Your business depends on the effectiveness of the insecticide you use, so always use reliable—proven CHLORDANE!

VELSICOL

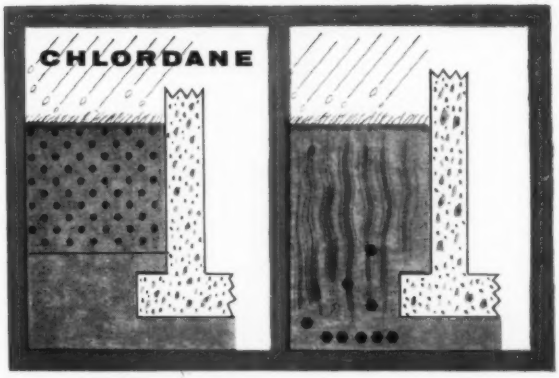
VELSICOL CHEMICAL CORPORATIO

330 East Grand Avenue, Chicago 11, Illinois

CHLORDANE MAINTAINS STABILITY 19 YEARS! Test conditions were established which duplicated nineteen years of actual contact with highly alkaline soil. Chlordane was mixed with calcium carbonate, a compound with a high alkalinity rating. Soil with a similar alkali rating would not support vegetation. This mixture, together with a sample of Chlordane without calcium carbonate, was heated to a temperature that accelerated the reaction to thirty-eight times what it would be at normal soil temperatures, and held at this high temperature for six months. The result: at the end of the test – a simulated 19 year period – the Chlordane with highly alkaline calcium carbonate was still the same strength as the Chlordane without the calcium.



CHLORDANE PROVEN EFFECTIVE IN USE FOR TEN YEARS! The effectiveness of Chlordane for termite control has been proven by the results of actual field use over a period of more than ten years. Treatments made by pest control operators as long ago as 1946, in many different parts of the country, have been checked for reinfestation. These treatments were made in all types of soils, to protect many different types of buildings, under widely varying climatic conditions. Here is the proof that Chlordane applied as long as ten years ago is still 100% effective. No other insecticide is backed by such a wealth of data proving effectiveness and safety. No wonder so many PCO's rely on Chlordane!



Chlordane stays put in the kill zone. Non-viscous insecticides tend to wash down out of the kill zone.

CHLORDANE STAYS PUT! Chemical stability, of course, is only one of the reasons why PCO's prefer Chlordane. Stability in alkaline soils means little if the physical characteristics of the insecticide are such that it washes out of the soil, or leaches down to a level that is below the normal path of termite entry. Chlordane, however, is a non-crystaline, sticky, viscous substance that combines with soil particles, and stays put in the vital kill zone around building foundations. Heavy rainfall and lawn sprinkling will never float it off or bury it too deep for effectiveness.

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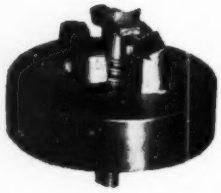

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Limitations On Food Product Pest Control

It appears the days are numbered for any individual with a sprayer and a gallon of insecticide who wants to become a pest control operator. This business is becoming more exacting; requiring greater care in the application of chemicals. The financial and legal responsibilities connected with a PCO's operation are increasing, too.

Take for example the increased emphasis government officials are giving to the contamination of food by insecticides. Their concern is not only with the application of pest control chemicals to raw agricultural products, but also with "after-harvest" pesticide applications on food in any stage of its processing or storage.

Dr. Philip J. Spear, technical director for the NPCA, said recently, "The establishment of pesticide tolerances in raw agricultural commodities has serious implications for PCOs. It has focused attention on the residue problem." Regardless of the extreme difficulty in protecting foodstuffs from pests by means of pesticides without introducing detectable quantities of insecticides, the presence of these deposits are legally adulterants, he warned.

In December, Frank J. McFarland, of the Food and Drug Administration, told members of the insecticide industry meeting in Washington, the Federal Food, Drug and Cosmetic Act restricts the presence of deleterious matter in any food product.

Dr. George C. Decker, top entomologist from the Illinois Natural History Survey, told PCOs meeting at Purdue this year (story on page 34), they must use control methods which eliminate any possibility of contaminating food with pesticdes or face the possibility of being held responsible in a FDA seizure of food so contaminated.

It takes no fortune teller to foresee the significance of the observations made by these three experts in the last six months. You may need a good lawyer to determine the extent of your liability under existing contracts with food plant customers. You may need broader liability insurance coverage, and it may cost you more. Customers should be told it will require more time and cost them more to have the pest control protection that meets food and drug laws.

Many of the pesticidal tolerances set by the FDA are based upon recommendations of toxicologists at the Communicable Disease Center of the U. S. Public Health Service. Read carefully the CDC's current recommendations for the use of insecticides and rodenticides beginning on page 9 of this issue. Many apply to food plants.

PEST CONTROL

EVERY MONTH SINCE 1933

JAMES A. NELSON, Editor — R. J. HOFFER, Circulation Manager

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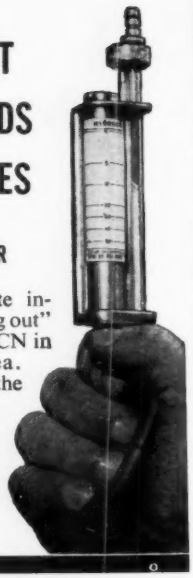

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Letters

Hits Sodium Fluoride and Lime Mixture as Roach Powder

In the December issue of *Pest Control* you ran an article by Lt. Commander F. R. DuChanois entitled, "Cockroach Control at Naval Installations." On page 10, Commander DuChanois said, "Later Hockenyos found that the addition of lime to sodium fluoride powder greatly increased its contact effectiveness."

This was a very unfortunate quotation from a strictly technical paper having to do with the chemistry and physiology of the penetration of the fluoride ion through the body integument of the roach.

Lime and sodium fluoride are worse than useless as a roach powder. I did learn from the experimental work that the best diluent for sodium fluoride is Pyrophyllite.

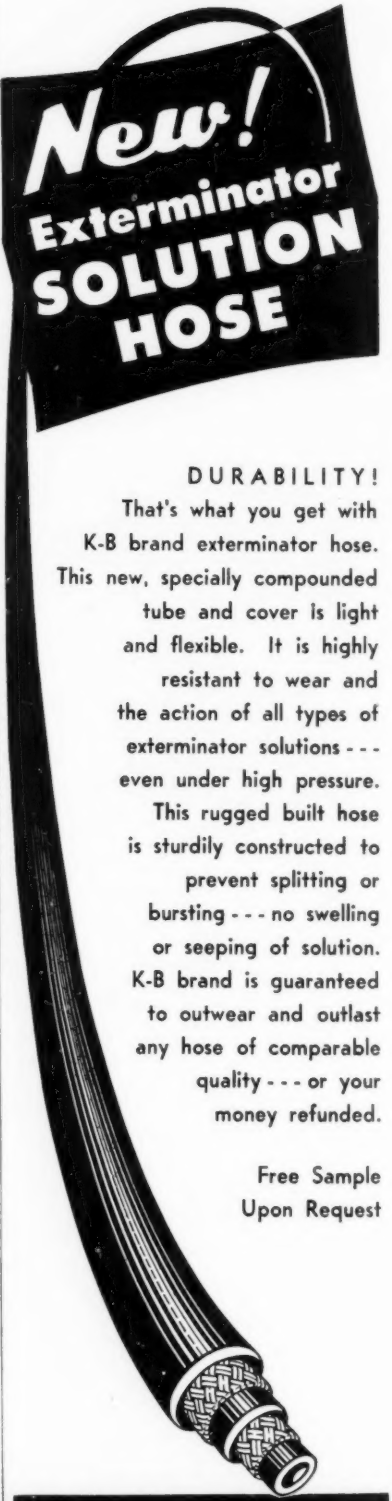
A roach's body integument is covered with an oily secretion produced by well-distributed glands. The oil could be removed, we found through experimentation, by solvents such as either, and then recovered. The recovered oil had the typical roach odor and we presumed this to be the main source of this objectionable characteristic. The integument of roaches contains canals which are normally filled with moisture, as was shown by microscopic examination of mounted slides and later confirmed by electron-microscope examination.

The oily film retards the penetration of the slightly water soluble sodium fluoride into and through the body integument via the canals or pores. Pyrophyllite is like lime, it pulls the oily film off the integument and permits rapid diffusion of the fluoride through the water-filled canal pores and into the roach's body.

My paper was published over 20 years ago and caused me some embarrassment at that time due to the fact a lot of people tried to use the lime-fluoride combination which was never recommended in the paper or afterwards. Lime and fluoride react slowly even in the dry state to produce ineffec-

(Continued on page 59)

New! Exterminator SOLUTION HOSE



DURABILITY!

That's what you get with K-B brand exterminator hose. This new, specially compounded tube and cover is light and flexible. It is highly resistant to wear and the action of all types of exterminator solutions - - - even under high pressure. This rugged built hose is sturdily constructed to prevent splitting or bursting - - - no swelling or seeping of solution. K-B brand is guaranteed to outwear and outlast any hose of comparable quality - - - or your money refunded.

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DEALERS AND FORMULATORS: Profit by the consistent promotion of this tried-and-proven product. Clean merchandising program maintained for eight years assures fair prices, plenty of *profitable* business for all!

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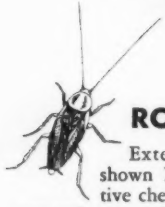

ROACH CONTROL

Extensive research and field testing have shown Diazinon to be one of the most effective chemicals for control of resistant as well as non-resistant roaches.

Diazinon is extremely economical ... only 2½ fluid ounces of GEIGY DIAZINON 25E (25% emulsifiable) per gallon of water or deodorized kerosene, applied as a spot treatment, to baseboards, around water pipes and other areas frequented by roaches, gives sure and fast results. Positive residual control reduces the number of service calls and repeat applications required.

Diazinon is recommended for cockroach control by Pest Control Operators *only*. Reduce your roach control service costs with GEIGY DIAZINON 25E.

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Diazinon is the most effective and economical residual fly control chemical available. Reports of its outstanding effectiveness have been received from research workers in 39 states.

Diazinon provides excellent control of flies and fly maggots under a variety of conditions. It may be applied in over all residual sprays, in "spot" sprays and in dry and liquid baits.

Whether the existing problem involves maggot control in breeding areas around garbage dumps and trash piles or control of flies around porches, in dairy barns, livestock loafing sheds, calf barns, hog barns or other farm buildings, there is a specific GEIGY DIAZINON product for your particular needs.

GEIGY DIAZINON 25E is available in pint, gallon, and five-gallon containers through the principal distributors of chemicals to the Pest Control Industry.

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1957 Report

from the

Communicable Disease Center

PUBLIC HEALTH PESTICIDES

CDC

For Mosquitoes, Flies, Fleas, Roaches, Bed Bugs, Ticks, and Rodents

From the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Savannah, Georgia

PUBLIC HEALTH Pesticides is an annual release prepared by the Communicable Disease Center on the current status of the chemical control of pests of public health significance. The information presented is based on investigations conducted by the Technology Branch, Communicable Disease Center, supplemented by data from the literature and from unpublished material provided by other research organizations.[1] Particular emphasis is placed upon those pesticides which, under test or field conditions, have provided the highest level of control which are compatible with human safety. Such a summation precludes the consideration of all chemicals capable of exerting suppressive effects upon the pests discussed. In addition, data on experimental compounds that, as yet, are unavailable for public usage have been omitted. Information on such compounds may be obtained by writing to the Technical Development Laboratories, Communicable Disease Center, Box 769, Savannah, Georgia. In the current review, control measures which remained unchanged from those recommended in 1956 may be restated verbatim.

In this report, chemical control measures are discussed as they relate to groups of arthropods or to rodents. In companion releases from the Communicable Disease Center, the individual pesticide is discussed in its relation to the control of insects and rodents of public health importance and to its toxicological status. These releases, "Clinical Memoranda on Economic Poisonings" and "Operational Memoranda on Economic Poisons" may be obtained by contacting the Communicable Disease Center at the address previously stated.

In utilizing any of the measures outlined herein, it is important that the limitations of the individual treatment be recognized. The general tendency to use a single method to cope with a pest in a variety of situations leads to disappointing and ineffective results. In addition, studies of control measures usually relate to specific geographic areas involving certain climatic characteristics and physiological and behavioristic qualities of the strain of the arthropod concerned. Thus, measures which are effective in one area of the country may be of lesser or greater value in other sections. The influence of climate upon the adequacy of a chemical measure is further complicated by possible resistance to the pesticide in the species involved or by inefficient application techniques. To achieve the maximum success in control operations, the individual must give full recognition to these factors in the field evaluation of a control measure.

At present, the greatest hindrance to chemical control of arthropods is the ability of certain species to develop resistance to a pesticide to the extent that it fails under field conditions. To relate control failure to resistance rather than to other factors, measurements of the susceptibility levels of the insect to the compound must be made. Preferably, such tests should be initiated before control operations are begun; however, where this is not possible, comparative data on the susceptibility levels of the species may be obtained by testing specimens from treated and untreated areas. This detection of resistance under field conditions can be accomplished without detailed laboratory tests. The initial finding of resistance of adult *Anopheles quadrimaculatus*, *Psorophora confinnis*, and *P. discolor* was by means of a simplified method developed by the Communicable Disease Center. Unfortunately, simplified procedures are not available for the detection of resistance in all public health pests. Information on available simplified techniques can be obtained by writing to the Center.

In control operations, the use of chemical measures against adult and larval stages of the insect will provide maximum initial re-

1. Particular acknowledgemnt is made to the Entomology Research Branch, U. S. Department of Agriculture (A); to the Florida State Board of Health, Bureau of Entomology (B); and to the California Department of Public Health, Bureau of Vector Control (C); for providing certain unpublished experimental data for inclusion in this resumé. All references in text to these organizations are by small capital letters as indicated above.

warfarin...

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The story of *warfarin* began in the world-famous laboratories nestled in a corner of the University of Wisconsin campus. The Wisconsin Alumni Research Foundation, created in 1925 to develop ideas of benefit to mankind and to prevent their misuse," has received acclaim the world over for the well-known rat and mouse killer.

The Foundation began with nine alumni, $900 and an undeveloped invention from the University of Wisconsin. These foresighted men formed the Foundation to protect the public from exploitation of University developments, and to support research in the natural sciences at the University. So successful were they that President E. B. Fred later referred to the Foundation as "a tool for returning to the public the fruits of important discoveries."

***Warfarin* is an important chapter in the Foundation's work. Within one year of its introduction, it proved to be the most effective and safe rodenticide known to man. In the past seven years it has provided the pest control industry with a powerful weapon that is reducing the rodent population to an extent never dreamed of a few years ago.**

Be sure to look for the name "*warfarin*" on the label, developed and backed by the Wisconsin Alumni Research Foundation.

WISCONSIN ALUMNI RESEARCH FOUNDATION

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Madison 1, Wisconsin

Table 1. Number of gallons of finished spray of varying concentrations required to produce specific dosages of toxicant in milligrams per square foot.

Percent concentration of formulation	Gallons of spray required per 1000 sq. ft. to give:			
	200 mg./sq. ft.	100 mg./sq. ft.	50 mg./sq. ft.	20 mg./sq. ft.
5.0	1.0	0.5	0.25	0.1
2.5	2.0	1.0	0.50	0.2
1.0	5.0	2.5	1.25	0.5
0.5	10.0	5.0	2.50	1.0
0.25	20.0	10.0	5.00	2.0

Table 2. Number of pounds of dusts of varying strengths required to produce specific dosages of toxicant per acre.

Percent Concentration of dust	Pounds of dust required per acre to give toxicant dosage of:				
	2 lb./A	1 lb./A	0.5 lb./A	0.2 lb./A	0.1 lb./A
5.0	40	20	10	4	2
3.0	66	33	16	7	4
2.0	-	50	25	10	5
1.0	-	-	50	20	10
0.5	-	-	-	40	20

duction of the population. However, exposure of the insect to the chemical in both larval and adult stages or in the larval stage alone exerts a greater selection pressure upon the population as to the possible development of resistance than would exposure of the adult stage only. Because of the general effectiveness of organophosphorus compounds in controlling insects resistant to chlorinated hydrocarbon insecticides, previous releases have indicated that where larvicidal treatments are necessary, these compounds should be employed for that purpose to avoid development of or augmentation of resistance to chlorinated hydrocarbon toxicants by the insect population, thus making possible the effective use of the latter pesticides in adulticiding operations. Frequently, DDT, chlordane, and BHC and similar insecticides which are of little or no value in control of mosquito larvae, still possess adequate effectiveness against the adult population.

However, laboratory studies by several investigators now show that susceptible house fly strains selected for resistance to parathion or Diazinon have developed high levels of resistance to DDT, dieldrin, and other chlorinated hydrocarbon insecticides, even though not exposed to any of the latter compounds. From these data, it is apparent that the use of organophosphorus larvicides may not prevent the development of, or the increase of, resistance to chlorinated hydrocarbon toxicants in the insect population under field conditions. Nonetheless, until evidence is available from field operations to validate or invalidate this possiblity, this procedure is considered the method of choice when both chemical larvicidal and adulticidal operations are necessary. Whenever possible, chemical larval control should be avoided in favor of permanent measures such as sanitation, drainage, etc. If organophosphorus larvicides are utilized, measurements of the resistance levels of the adult insects to chlorinated hydrocarbon insecticides should be made in conjunction with the use of the latter pesticides in adulticiding operations.

Throughout the major part of this release, the dosage of toxicant employed is expressed as technical material in terms of milligrams per square foot, pounds per acre, or parts per million. It is apparent that the dosage of the toxicant applied is dependent upon the concentration of the formulation used, together with the rate at which the material is dispersed. Thus, a 1 percent formulation sprayed on a surface at the rate of 1 gallon per 500 square feet provides a dosage in milligrams per square foot equivalent to the treatment of 1000 square feet with 1 gallon of a 2 percent formulation. The choice in selecting the concentration of a formulation is influenced by the coverage necessary, type of surface, toxicity of the pesticide, transportation requirements, and the equipment available. Certain of the formulation strengths required to give specific dosages are listed in tables 1 and 2. Further details of preparing solutions, dusts, etc., are outlined in the Operational Memoranda on Economic Poisons issued by the Communicable Disease Center.

MOSQUITO CONTROL

Among mosquito disease vectors, physiological resistance to chlorinated hydrocarbon insecticides has been demonstrated in *Anopheles quadrimaculatus* (United States), *A. gambiae* (Nigeria), *A. sacharovi* (Greece, Lebanon), *A. stephensi* (Saudi Arabia), *A. sundaicus* (Indonesia), *Aedes aegypti* (Trinidad, B. W. I.), *Culex pipiens quinquefasciatus* (India) and *C. tarsalis* (United States). Certain of these species, such as *A. quadrimaculatus* and *A. gambiae*, are resistant to dieldrin deposits but remain susceptible to DDT residues. Other species (*A. sundaicus, A. stephensi, Aedes aegypti*) have developed resistance to DDT without loss of susceptibility to dieldrin.

In addition to *C. tarsalis* and *A. quadrimaculatus*, seven other species in the United States are resistant to the chlorinated hydrocarbon insecticides: *Culex pipiens, Aedes sollicitans, A. taeniorhynchus, A. dorsalis, A. nigromaculis, Psorophora confinnis,* and *P. discolor.* In the areas where the mosquitoes are resistant to DDT, chlordane, and other chlorinated hydrocarbon insecticides, there has been a general shift to the use of organophosphorus compounds in mosquito control. Although data in 1955 (A. C) indicated that *A. nigromaculis* larvae had not shown any

significant change in susceptibility to malathion from 1951 to 1955, investigations in 1956 by the same agencies have revealed a malathion-resistant strain of *C. tarsalis* in an abatement district where the chemical has been in use for 2½ years. The resistance was apparent in both larval and adult stages. This report is the first instance of resistance to an organophosophorus compound in mosquitoes.

In the absence of DDT-resistant *A. quadrimaculatus*, adult chemical control measures remain the same; i.e., application of a 5 percent DDT-emulsion for residual treatment of dwellings or a 5 percent DDT-oil solution for outdoor space treatments. In foreign countries where the anopheline species are resistant to DDT residues, a 0.625 or 1.25 percent dieldrin suspension or emulsion can be employed. Control of anopheline larvae can be obtained either by hand spray application of 0.05 pound of DDT in 1 gallon of fuel oil per acre or by airplane application at the rate of 0.05 to 0.10 pound of DDT per acre, applied as a 20-percent solution in methylated naphthalenes, such as Velsicol NR-70 or Sovacide 544B.

In the control of culicine mosquitoes resistant to the chlorinated hydrocarbon insecticides, the organophosophorus compounds are the pesticides of choice. In California against *C. tarsalis* and *A. nigromaculis* larvae, malathion and parathion have been the two toxicants generally employed. With ground equipment, application rates for malathion and parathion are 0.4 pound per acre and 0.075 pound per acre, respectively. Airplane treatments disperse malathion at a maximum rate of 0.5 pound per acre, parathion at 0.1 pound per acre. EPN, applied at the rates of 0.035 lb. per acre by ground equipment and 0.075 lb. per acre by airplane, also is effective against these species. Under the careful supervision exercised by the California State Department of Public Health, there has been no indication that applications of these three pesticides over a 5-year period resulted in any harmful effects to the operators or to the public. Special precautions, particularly with parathion, are followed in the handling and application of the pesticides. Care is taken to avoid treatment of populated areas or of areas near maturing food crops.

Experiments in California [A] in which parathion was added to irrigation water applied to pastures, showed concentrations of this toxicant at 0.01, 0.02, and 0.05 ppm to be highly effective in controlling *Aedes nigromaculis* breeding up to a distance of 0.25 mile. Higher concentrations (0.075 and 0.1 ppm) gave excellent larval mortalities for a distance of 0.37 mile. In Oregon, good control of *Aedes* breeding was obtained in a pasture similarly treated with parathion at a rate of 0.02 ppm. However, in a second pasture of irregular topography, application of 0.04 ppm gave erratic kill of *Aedes* larvae, poor control being evident at distances greater than 0.3 mile from the point of influent.

Outdoor aerosol treatments of malathion have been shown to be more effective than BHC, DDT, or pyrethrum formulations in reducing annoyance by *A. nigromaculis* [A C]. Diesel oil formulations containing 5 percent malathion and dispersed at the rate of 12 gallons per linear mile, produced a 95 to 100 percent reduction in the mosquito landing rates of *A. nigromaculis* for a distance of 100 yards from the machine.

Both malathion and parathion are effective against multi-resistant adults and larvae of *Aedes taeniorhynchus* and *Aedes sollicitans*. In laboratory tests [A] complete mortalities of salt marsh mosquito larvae were obtained with parathion and malathion at concentrations of 0.0025 and 0.1 ppm respectively. Airplane treatments of salt marsh areas in Florida with parathion granules at a rate of 0.05 - 0.1 lb. of toxicant per acre gave excellent reduction of mosquito breeding [A, B]. Results with malathion granules were less consistent, the percentage reduction of larvae ranging from 64 to 99 at dosages of 0.4 to 0.5 lb. per acre. In contrast, limited experiments[A] with fuel oil sprays of malathion at rates of 0.1 to 0.25 lb. of toxicant per acre, gave reductions of 78 to 99 percent. However, for penetration of heavily vegetated areas, the granular or pelletized formulations of the pesticides appear to be the best means of application.

In recent tests against resistant adult salt marsh mosquitoes in Florida[A] airplane application of malathion in fuel oil at a dosage of 0.5 lb. per acre gave 100 per cent reduction at 6 hours after treatment as compared with mortalities of 64 to 99 percent at a

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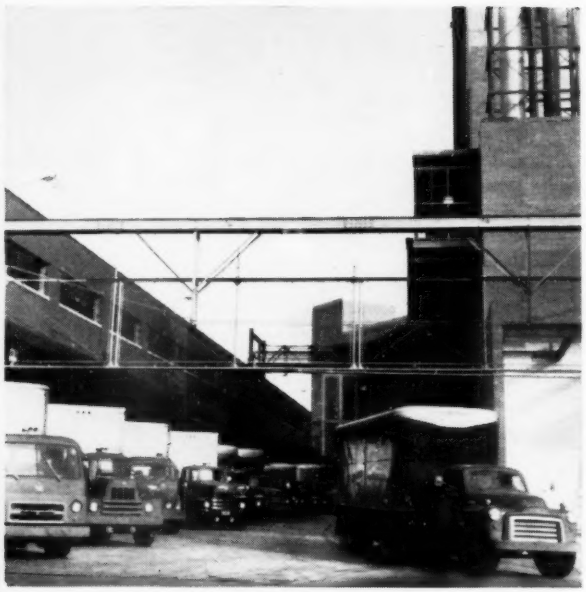

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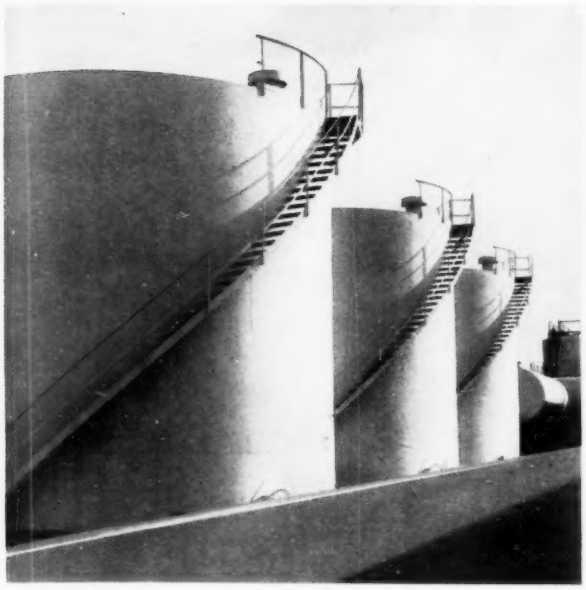

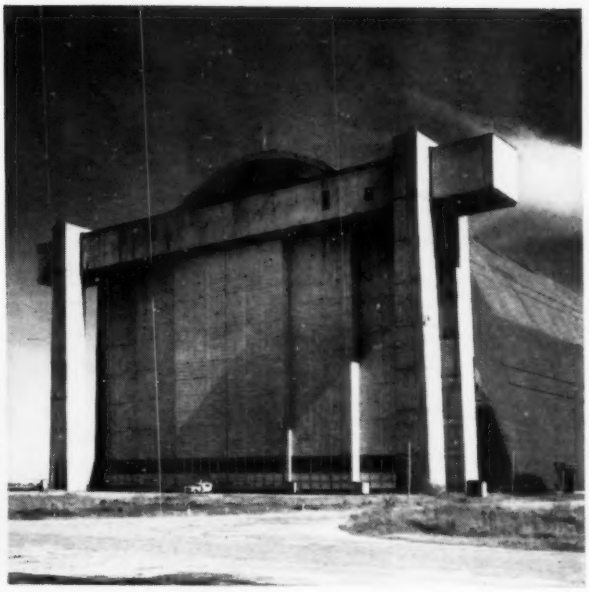

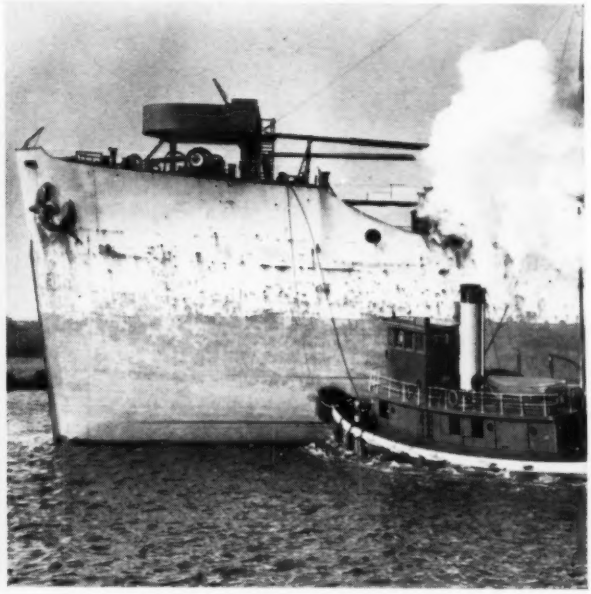

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rate of 0.25 lb. per acre. At a rate of 0.1 lb. per acre, the reduction was 23 to 70 percent. Part of the variation in mortalities may have been the result of the type of area treated.

In areas where salt marsh mosquitoes (or other culicines) are susceptible to chlorinated hydrocarbon insecticides, DDT at 0.05-0.10 lb. per acre is an effective larvicide. With DDT-resistant salt marsh mosquito larvae, dieldrin, chlordane, heptachlor, endrin, or lindane at 0.1 lb. per acre can be substituted for DDT. Where fish and other wildlife are not a factor (sewage lagoons) and the above dosages are ineffective, these rates of application can be increased materially.

Excellent nighttime control of susceptible adult salt marsh mosquitoes has been obtained at a drive-in theatre at Savannah, Georgia, by single fog applications of 1 gallon of 2.5 percent DDT, 1.0 percent chlordane, or a pyrethrum formulation containing 0.25 percent pyrethrins and 2.0 percent piperonyl butoxide in a 1:1 fuel oil-kerosene solution. Application of the fog at or after dusk was essential to effective abatement. Treatment of the area before the major infiltration of the mosquitoes occurred gave poor results. With DDT-resistant adult salt marsh mosquitoes, control has been achieved by use of a fuel oil solution of heptachlor or lindane applied by an airplane at a rate of 0.1 pound of toxicant per acre. Dieldrin at 0.2 pound per acre also gave satisfactory control. With ground equipment, BHC and heptachlor dispersed at rates of 0.04 and 0.07 pound of toxicant per acre, respectively, provided excellent reduction of salt marsh mosquito annoyance.

In localities where *Psorophora* mosquitoes are susceptible to dieldrin, the breeding of these pests in irrigated rice fields can be controlled for an entire season by a single preflood application of dieldrin emulsion at the rate of 1 pound of toxicant per acre. However, the rapid development of resistance to dieldrin by *P. confinnis* and *P. discolor* in Mississippi indicates that effective use of this pesticide may be limited to one or two seasons in some areas.

Field studies with organophosphorus compounds, either as granular preparations or as an injection of the toxicant in the irrigation influent, offer little promise that ether procedure can be employed successfully to control *Psorophora* breeding under current methods of rice field irrigation in Mississippi. The rice fields are flooded by contour terrace irrigation wherein the water, to reach a given terrace, passes through the terraces intervening between that terrace and the water source. In many instances, however, the water moves into terraces by subsurface seepage.

Granular preparation of malathion and three experimental organophosphorus insecticides, broadcast at rates of 0.75 pound per acre on dry plots one day before flooding, failed to give satisfactory reduction of *Psorophora* larvae in the flooded plots. Injection of an experimental organophosphorus compound or parathion into the irrigation influent has given poor control of *Psorophora* breeding in the rice fields, particularly in terraces removed from the source of the introduction of the treated water. Application of a solubilized parathion formulation at a rate of 0.02 ppm to a 94-acre rice field gave excellent kill of *Psorophora* larvae in terraces near the influent but heavy breeding persisted in the outlying terraces, even in one section of the field of less than 10 acres, which was flooded independently. Usually, such heavily infested terraces had been flooded by subsurface seepage water and this seepage, together with the time required for the complete flooding of the field presumably were the factors which rendered the treatment ineffective. In Arkansas, studies[A] have shown that where the fields are flooded directly from canals and not through successive terraces, a dosage of parathion of 0.02 ppm can give an effective kill of *Psorophora* larvae. Under these irrigation conditions, the treated water moved 0.6 mile in the canal and almost 0.4 mile in the field.

Although postflood treatments with malathion at a dosage rate of 0.2 pound per acre were highly effective against *Psorophora* larvae, such applications are of little value in controlling infestations in rich fields since the time period required to flood large acreages results in progressive hatching of the mosquitoes over a period of several weeks in different parts of the same field. Thus, to control the breeding over a large field it would be necessary to make repeated postflood treatments, an unfeasible method from the practical standpoint. In such situations, barrier-strip spraying around individual premises and the use of space sprays to control the adult mosquitoes in populated areas appear to be the only feasible approach to the problem at present.

Barrier strip treatments with DDT around individual premises will afford relief from daytime annoyance by certain pest mosquitoes. In the Savannah, Georgia, area, DDT applied as a 1.25 percent emulsion at rates of 5 to 10 lb. per acre to the outside of houses and to shrubbery, grass, and other vegetation within a radius of approximately 100 feet of the dwelling caused significant reduction in daytime annoyance from salt marsh mosquitoes for periods of 1 to 9 weeks. Other pesticides—BHC (1.3 lb. gamma isomer per acre), dieldrin (4 lb. per acre), lindane (0.5 lb. per acre), Diazinon or malathion (2 lb. per acre) —were ineffective. Varations in the duration of effectiveness of the DDT treatments is attributed to mosquito potential, more fre-

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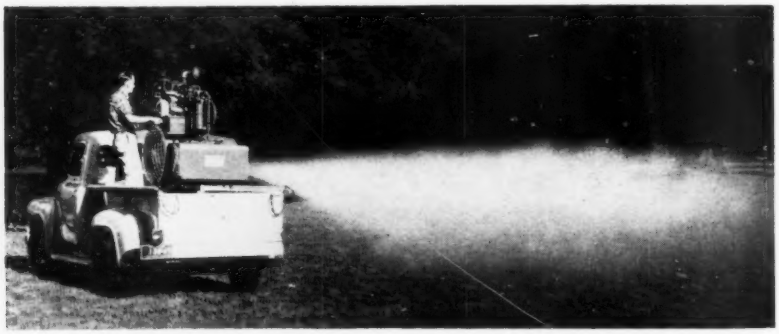
quent treatments being required whenever weather conditions permit excessive mosquito production. In 1952, 1954, and 1955, the application of 5 lb. of DDT per acre gave 5 and 6 weeks of relief from mosquito annoyance. In 1953, the same treatment was effective for 1 to 2 weeks.

Residual larviciding with technical BHC (12 percent gamma isomer) emulsions at the rate of 1 lb. per acre (in 2 gallons of finished spray per acre applied in the same manner as oil solutions) has given satisfactory mosquito control in small, landlocked, freshwater ponds near Savannah, Georgia, against a variety of anopheline and culicine species for periods ranging from 5 to 8 weeks. No damage to fish was observed during 3 consecutive years of treatments with BHC, during which time five treatments were made each year, spaced at approximately 5-week intervals between April and October for a total of 15 1-pound-per-acre applications during the 3-year period. There was some indication of off-taste in fish from one of the treated ponds in which unusually low water levels had prevailed at the end of the third year of treatment. It appears that technical BHC (12 percent gamma isomer) can be applied safely as emulsions at the rate of 1 lb. per acre at approximately 5-week intervals for at least 3 consecutive years without damage to fish.

Mechanical separator used to separate anopheline pupae from larvae. Over one million insects are reared annually for research purposes.

In landlocked ponds where fish are not present, effective control for periods ranging from 3 to 6 months has been accomplished by residual larviciding with DDT emulsion at the rate of 3 pounds of DDT per acre (in 2 gallons of finished spray), using the method usually employed in applying oil-mist sprays as mosquito larvicides. In similar ponds, dieldrin applied as an emulsion at the rate of 1 pound of dieldrin per acre, prevented mosquito breeding for more than 1 year. *These treatments are totally destructive to fish and should not be used in ponds where such wildlife is present.*

Residual larvicide treatments also offer promise in the control of various species of *Aedes* and *Culex* in the western United States. Limited experiments with dieldrin, DDT and heptachlor against culicine breeding (*C. tarsalis*, *C. stigmatostoma*, *C. pipiens*, and *Culiseta incidens*) in log ponds in Oregon indicated that dieldrin emulsion and heptachlor granules at 3 and 5 lb. of toxicant per acre, respectively, gave good control for 14 weeks. DDT, at a rate of 10 lb. per acre,



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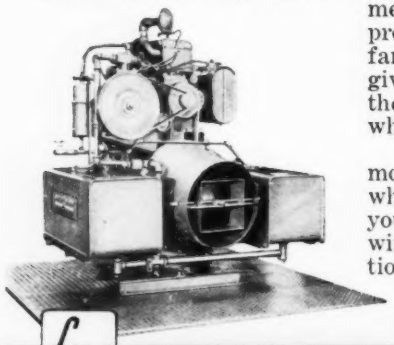

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was much less effective. In studies at Chinook, Montana, preflood or postflood treatments of alfalfa fields, pastures, and ditches associated with irrigation, with dieldrin and heptachlor at rates of 1.0 and 1.5 lb. of toxicant per acre were effective in preventing breeding of *Aedes dorsalis*, *A. vexans*, and *Culex tarsalis* for extended periods (6 - 16 weeks). Dieldrin was employed as 10 percent granules or 0.5 percent emulsion, heptachlor as 5 percent granules and 0.75 percent emulsion.

FLY CONTROL

• Sanitation

Successful fly control is contingent upon improved environmental sanitation and the judicious application of insecticides. Prevention of fly breeding or fly entry reduces the disease transmission potential and at the same time increases the relative value of any chemical in diminishing fly prevalence. Regardless of the potency of the chemical application, fly control cannot be achieved in the face of unlimited breeding sources. Consequently, sanitation and practices which will exclude flies from homes, restaurants, and other places frequented by man, should be exploited continuously to the maximum degree.

• Chemical Control Measures

The resistance of *Musca domestica* to chlorinated hydrocarbon insecticides led to a gradual shift to the use of organophosphorus compounds in house fly control. The absence of any field resistance in *M. domestica* to organophosphorus compounds after several years of usage has been encouraging. However, both laboratory and field data now indicate that the house fly can lose its susceptibility to insecticides of this type. In Denmark where organophosphorus pesticides have been in use for fly control since 1951-2, resistance to Bayer 21/199, Diazinon, and parathion has been demonstrated in several field strains. This resistance is coupled with reported control failures in farm areas. In the United States, there have not been any reports of any general loss of susceptibility to these chemicals by the house fly. However, at Savannah, Georgia, in 1956, weekly applications of a malathion poison bait lost their effectiveness in controlling house fly populations at a dairy in late summer, even though excellent abatement had been obtained during the preceding 12 weeks. Laboratory and field tests revealed that this strain of *M. domestica* no longer was attracted to any of several malathion baits and, in addition, was less susceptible to malathion topical applications than a laboratory strain. Thus both behavioristic and physiologic resistance to malathion have been detected in a field strain of *M. domestica*. The same bait was used at a second dairy but no loss of control was apparent at it throughout the season.

These findings indicate that control operators must be on the alert to detect any evidence of loss of control with the organophosphorus compounds now used against *M. domestica*. They also stress the need for routine evaluation of the susceptibility levels of the house fly population in any control program. Only by this means can it be effectively determined when an insecticide begins to lose its toxicity to house fly populations.

• Residual Treatments

In areas where house flies are susceptible to DDT, this chemical is still the insecticide of choice, except in dairy barns or other situations where it may contaminate milk or food. Finished emulsions or suspensions of 5 percent DDT will provide effective residues when applied to the point of run-off.

Where DDT-resistant house fly populations develop, a number of other chlorinated hydrocarbon insecticides can be utilized as initial substitutes. In time, the flies may develop resistance to one or all of the substitute chemicals, but the onset and rate of development of resistance is contingent upon the locality and the history of insecticidal treatment. Dieldrin, applied to the point of run-off as a 0.625 or 1.25 percent emulsion on exterior surfaces of houses (including porches) and in animal shelters, has provided satisfactory control of DDT-resistant house flies. Chlordane also

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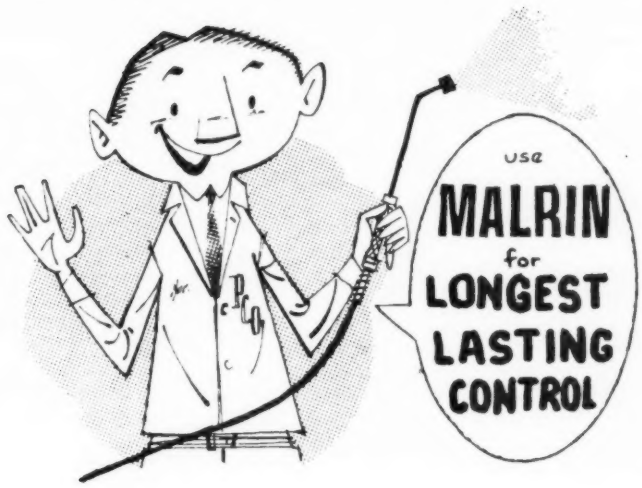

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is effective against DDT-resistant house flies and should be used as a 2.5 to 5 percent emulsion for treating porches and semiprotected exterior surfaces. Application within homes should be limited to treatments of selected surfaces such as doors, window sills, and screens, using a 2.0 to 3.0 percent formulation. Lindane applied at the rate of 25 mg. per square foot, or methoxychlor at 200 mg. per square foot is suitable for use in dairy barns, feed barns, and other places where the use of other chlorinated hydrocarbon pesticides is not permitted.

Residual treatments of privies, including the pit contents, with dieldrin, BHC, or chlordane should be avoided since studies show that such applications markedly increase the production of house flies therein. In addition, untreated privies have been shown to be a poor source of house fly breeding.

Dilan is effective in the control of DDT-resistant house flies when combined with DDT and cottonseed oil. This formulation applied at rates of 200:200:80 mg. of Dilan:DDT: cottonseed oil per square foot has satisfactorily controlled house flies for periods of 5 to 8 weeks in experimental barns. It can be utilized as a residual treatment, except in dairy barns and other locations where milk and food contamination may result.

A number of organophosphorus compounds provide residues effective against house flies for periods of 1 to 7 weeks but only two materials (malathion and Diazinon) are commercially available and approved for use in dairy barns. Both of these insecticides can be employed safely as residual sprays at strengths of 0.5 to 1.0 percent. However, where routine applications of these toxicants are being made, especially Diazinon, it is desirable to maintain a periodic check on the cholinesterase levels of the operators.

Laboratory and field tests indicate that a sugar additive generally augments the effectiveness of residues from emulsion formulations of malathion, Diazinon, and other candidate organophosphorus insecticides. The relative value of this sugar varies with the toxicant; certain experimental compounds show little residual activity when used alone. As a general rule, the sugar is added to the formulation at a rate of 2.5 parts of sugar to 1 part of toxicant.

Bait Station used in poison fly bait studies.

Malathion-sugar emulsions or suspensions applied in dairy barns at rates of 200 mg. of malathion and 500 mg. of sugar per square foot have provided excellent house fly control for periods of 1 to 5 weeks.

Diazinon - sugar formulations applied at a rate of 100 mg. of Diazinon and 250 mg. of sugar per square foot in dairy barns yielded excellent control of house flies for periods of 4 to 5 weeks. In other areas, investigators have reported similar or better results using Diazinon without sugar. In 1956 comparative evaluation of Diazinon formulations with or without sugar was made in four dairy barns. With an application rate of 100 mg. of toxicant per square foot, little difference was apparent in the control achieved at the dairy treated with the Diazinon-sugar spray and that receiving an application of Diazinon alone. However, with an application rate of 20 mg. of toxicant per square foot, the dairy receiving the Diazinon - sugar treatment showed 4 weeks effective house fly control as compared to an absence of control at the dairy sprayed only with Diazinon.

Reports indicate that at times the presence of sugar residues on barn surfaces in some areas results in unsightly growths of molds. However, in the Savannah, Georgia area where bait sprays have been employed in the treatment of experimental barns for several years, repeated application of 250 to 500 mg. of sugar per square foot has not resulted in mold contamination even in barns treated three to four times.

The use of the organophosphorus compounds, such as parathion and Diazinon, as cord impregnants represents a means of achieving effective house fly control on a season-long basis. A single installation of cotton cords (3/32″ diameter) dipped in a 5 to 10 percent parathion-xylene solution, or of similar cords (3/16″ diameter) immersed in a 25 percent Diazinon-xylene solution has yielded satisfactory to excellent control of house flies for periods of 5 to 6 months in dairy barns at Savannah, Georgia. Barns which have been treated with impregnated cords for 3 to 4 years continue to show minimal fly densities. Installation of parathion- or Diazinon-impregnated cords in barns, pig pens, chicken sheds, kitchens, and porches of 25 rural premises gave satisfactory to excellent fly control for 8 to 17 weeks, respectively. Limited tests on chicken ranches indicated the treated cord to be effective for periods of 8 to 19 weeks.

In military dining halls and kitchens excellent house fly control was obtained with parathion-impregnated cords (3/32″ diameter) for a 10-week observation period. Under the same conditions, Diazinon-treated cords (3/32″ diameter) impregnated in a 25 percent Diazinon-xylene solution, remained effective for 7 weeks.

Available data indicate that for maximum periods of effectiveness with Diazinon the larger size cord (3/16″ diameter) is necessary since the use of the smaller size cord (3/32″ diameter) did not provide adequate control of house flies in dairy barns for more than 7 weeks. The installation rate of these cords is 30 linear feet of cord per 100 square feet of floor area. A period of 2 to 3 weeks after cord installation may be required before fly densities are reduced to control levels. This

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time period is more characteristic of parathion-impregnated cords, the Diazinon-impregnated cords usually producing an immediate decline in fly densities. Laboratory tests with Diazinon-treated cords (3/16″ diameter) indicated that after 11 months of field exposure the cords gave more than 70 percent kill of house flies exposed to them for 30 minutes.

Because of the extreme toxicity of parathion, preparation of treated cord should be handled only by experienced formulators. Both the public and pest control operators should use only commercially prepared cords. For routine installation of the treated cords, the individual should wear cotton gloves. Periodic checks also should be made of the cholinesterase levels of all personnel routinely preparing or handling treated cords. As a maximum safeguard, impregnated cords should be colored or marked to avoid their possible use for purposes other than fly control. Details on the precautionary procedures for parathion are found in the Clinical and Operational Memoranda issued by the Communicable Disease Center. Although Diazinon has a lower toxicity level to humans than parathion, procedures similar to those outlined for that pesticide should be followed in the preparation and marking of Diazinon-treated cords.

Commercially prepared parathion- and Diazinon-impregnated cords have received approval for use in dairy barns, chicken ranches, and food producing establishments.

Residual treatments are effective against other flies that have resting habits similar to those of the house fly. The lesser house fly, *Fannia canicularis*, which frequently is a pest in chicken ranches and dairies, is readily susceptible to residual applications of dieldrin and malathion. Dieldrin at a dosage of 25 milligrams per square foot remains effective for extended periods whereas the toxicity of malathion deposits are relatively short lived. However, the latter compound will control both *Fannia* and resistant *M. domestica*.

● Poison Baits

Poison baits continue to receive widespread popular acceptance as a means of accomplishing fly control. The basic formulation of liquid and dry baits consists of an organophosphorus toxicant and a fly attractant (molasses, sugar, or other sweetening agent). Pesticides commonly employed in baits are malathion, Dipterex, Diazinon, and DDVP. Baits of malathion or Diaznion combined with DDVP also are registered for use against house flies. The attractant portion of the baits may be replaced in part by inert diluents of various types.

Liquid baits generally are composed of 0.1 to 0.2 percent toxicant and 10 percent attractant. Application is usually by means of a sprinkling can, and the bait is distributed at a rate of 1 to 3 gallons per 1000 square feet of floor area. If the floor surface is dirt, or is covered with debris, the bait should be sprinkled on paper or on metal or wooden sheets.

Dry baits are formulated to

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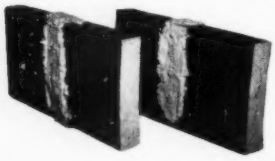
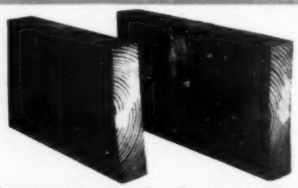


WOODTREAT-TC applied on Southern Yellow Pine on first day of penetration test.



Four days later. Note how Penta and oil have penetrated from point of application to end of board. Dried residue is almost ready to flake off or be brushed off.

Cross sections of boards at point of application. Note the very deep penetration of Penta in just 4 days!

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contain 1 to 2 percent toxicant and an attractant. The latter may be granulated sugar or an inert carrier coated or mixed with an attractant. Such baits are scattered over the floor surfaces at a rate of 2 to 4 ounces per 1000 square feet. Where debris is present, the bait should be placed in a container or on a sheet of wood, metal, or other relatively smooth material.

General coverage of the floor area with either type of bait is not desirable. Observation will show the sites of greatest fly concentration, and bait applications should be made at those points. Occasionally it may be necessary to utilize sites other than those at the floor level (window sills, stanchions).

The frequency of bait application depends largely upon the fly potential present. Where the potential is high, repeated applications are necessary. In studies at Savannah, Georgia, the use of permanent bait stations has resulted in good house fly control in two dairies with a minimum number of applications. These stations were plywood trays (18″ square) charged with a dry 2 percent malathion bait, placed at the rate of 4 oz. of bait per 1000 square feet. Approximately 8 to 12 stations were established at sites characterized by high fly populations. In the milking room baits also were scattered on boards, above the stanchions or on the floor and in one barn additional plywood trays (1/4′ x 1′) were utilized. Results indicated that after two treatments per week for the first two weeks satisfactory control was achieved for 12 weeks at one dairy with weekly applilcations of 1.5 pounds of bait. At the second dairy which received weekly treatments of 2.5 pounds of bait, control persisted till the end of the season (15 weeks). As indicated previously, resistance of the fly population to malathion resulted in the loss of control at one dairy. Adequate control was not re-established regardless of the frequency of bait renewal or the use of other types of malathion baits. Both of these dairies had been subject to residual treatments of malathion during the previous two years.

The principal values of poison baits lie in their relatively low cost per treatment and in their immediate suppressive effect upon fly densities. Bait treatments can produce spectacular reduction of high fly densities within a few hours. However, this effectiveness is of short duration unless further applications are made. Consequently, the success of bait applications in controlling fly populations is dependent on the diligence of the operator. Field substantiation of this point was shown by comparison of fly densities in four dairy barns in which the owners used poison baits. Over a 3-month period the results showed fluctuating levels of fly reduction; only one dairyman achieved satisfactory abatement.

While baits are used chiefly around dairies, animal shelters, abattoirs, and packing houses, such measures also can be of value in the control of blow flies and house flies frequenting garbage dump areas. A bait consisting of 2 percent toxicant and 50 percent molasses has given good control of these insects when applied to dumps at a rate of 1 gallon per 1000 square feet of area.

Baits containing malathion, Dipterex, DDVP, or Diazinon have been labeled for use in dairy barns. None of these baits should be used inside homes.

● Outdoor Space Sprays

Where house flies do not respond to control by residual or larvicidal treatments, space sprays represent the method of choice for chemical control on a community basis. This method also can be utilized for fly control at abattoirs, dumps, and other problem sites. In a locality of high fly potential, the effectiveness of a space spray treatment is limited and re-applications must be made, sometimes on a daily basis, to insure continued control. Since the efficacy of a space spray treatment depends on the insect coming in contact with the insecticidal droplets, applications must be adjusted to the daily pattern of fly activity.

Flies which are susceptible to the chlorinated hydrocarbon insecticides can be killed with emulsions or fuel oil solutions of several materials of this type such as DDT (5.0 percent), chlordane (2.5 percent), lindane (2 percent), or dilan (2.5 percent). If odor is not a factor, a 5 percent technical BHC emulsion (12 percent gamma isomer) is cheaper than lindane and equally effective. The rate of application per acre for these pesticides should be approximately 0.4 lb. for DDT and 0.2 lb. for the other pesticides.

Against DDT-resistant flies, chlordane, dilan, and lindane are effective. The addition of DMC to DDT formulations also will control DDT-resistant flies. Under field conditions a formulation of DDT:DMC at a ratio of 7.5:1 gave excellent reduction of house flies resistant to several chlorinated hydrocarbons.

Pyrethrum space spray is the least toxic to man and is among the most reliable as an insecticide. For indoor space spray treatments, it is the insecticide of choice. Pyrethrum formulations are used in combination with synergists (piperonyl butoxide, sulfoxide, and other) in emulsions or oil solutions containing from 0.05 to 0.1 percent pyrethrins and from 0.5 to 1.0 percent of the synergist. While pyrethrum formulations usually are uneconomical for general large-scale application in fly control, their use at problem sites frequently is feasible.

Preliminary tests indicate that malathion in fuel oil will provide effective kills of resistant adult house flies when applied by a mist blower as a 5 percent solution at a rate of 0.5 pound of malathion per acre.

● Larvicides

Larvicides are of value in fly control for the treatment of garbage or of animal excrement as it accumulates at stockyards, chicken farms, or other problem sites. However, the use of larvicides may cause or augment the rapid development of resistance in the fly population. Thus, sanitational practices should be regarded as the first line of defense with resort to larvicidal applications only as an emergency or occasional measure.

In the absence of resistance to

New York Passes Weed Control Law

It is much more effective to fight weeds in their infancy. Weed control parlays are being held in communities all over the country, especially in localities where water weeds are particularly troublesome. Other weed pests are steadily getting more attention. The New York legislature recently passed, and the governor signed, a bill which empowers county boards to appropriate funds for the elimination of noxious weeds. The same should be done in every state, and all local officials should be continuously prodded into necessary action.

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chlordane, lindane, BHC, or dieldrin in the house fly populations, such chemicals can serve as effective larvicides. These materials should be applied at the same dosage per square foot as is recommended for residual treatments. Aldrin also is toxic to fly larvae and should be applied at a rate of 25 to 50 milligrams per square foot.

In laboratory studies of EPN, Diazinon, malathion, parathion, and several experimental organophosphorus compounds against house fly larvae, Diazinon was found to be the most potent insecticide. Field comparisons of Diazinon and malathion as a fly larvicide in chicken excrement in California and Georgia indicate Diazinon to be the insecticide of choice. Recent tests[A, C] at a dosage of 100 mg. of toxicant per square foot resulted in a 99 percent reduction of house fly larvae with Diazinon compared to a 10 percent reduction with malathion. Suggested application rates are 50 to 100 mg. of Diazinon per square foot, the formulation being applied at a rate of 7 to 14 gallons per 1000 square feet. While Diazinon treatments eliminate the larvae present at the time of application, reinfestation usually occurs within 10 to 14 days.

The application of 2 oz. of paradichlorobenzene crystals (PDB) in garbage cans will give satisfactory control of fly breeding therein for 1- to 2-week periods.

As blow flies continue to remain susceptible to chlorinated hydrocarbons, these chemicals are effective in preventing blow fly infestations of carcasses and in controlling established blow fly infestations in carcasses. Limited studies have shown that dog carcasses sprayed with 1 pint of 0.25 percent aldrin, endrin, or Diazinon emulsion were protected from blow fly infestation for 26 to 30 days. Chlordane (0.5 percent), BHC (1.0 percent (15 percent gamma)), and malathion (0.25 percent) were less effective. In carcasses heavily infested with larvae, 0.25 percent emulsions of endrin, Diazinon, and malathion, and 0.5 percent emulsions of dieldrin and aldrin gave complete kill of full grown maggots. Concentrations of 2.0 percent chlordane and 5 percent BHC were required for effective reduction of the infestations.

In general, the chief difficulty in obtaining satisfactory larval control is the inadequate penetration of the medium by the toxicant. An application rate of 5 gallons of 0.5 percent formulation per 1000 square feet will give far better penetration of chicken excreta than 1 gallon of a 2.5 percent emulsion, even though both sprays provide the same dosage of toxicant. Consequently, the formulations used for larviciding should be made at 4 to 6 or more times the volume commonly employed for the insecticide when applied as a residual treatment. Since the pesticides used as larvicides also are toxic to the adult flies, spray applications should include surfaces which the adults contact upon emergence.

FLEA CONTROL

The oriental rat flea, *Xenopsylla cheopsis*, is readily controlled by the application of a 5 or 10 percent DDT dust to rat runs and harborage areas. While the 5 percent dust is equal to the 10 percent formulation in its effectiveness on *X. cheopis*, the greater toxicity of the 10 percent dust to other ectoparasites normally less susceptible to DDT, such as the cat flea, makes it the formulation of choice.

The dog and cat fleas, *Ctenocephalides canis* and *C. felis* are reported to be resistant to DDT and chlordane in areas in the southern United States. However, to date there has not been any laboratory confirmation of this resistance. Nonetheless, in field usage, organophosphorus compounds are being substituted for the chlorinated hydrocarbon insecticides. In recent tests in Florida[A] 1 percent emulsions of Diazinon, malathion, lindane, and chlordane gave good control of fleas when applied to the infested yards at the rate of 1 gallon of formulation per 1000 square feet. Control persisted for more than 1 month in most instances. Malathion dusts (4 to 5 percent) also are effective against cat and dog fleas.

Malathion is acceptable as 5 percent dust or as 0.5 percent spray for use in flea control on dogs and cats. Dipping of animals should be done with an 0.25 percent concentration of malathion under the supervision of a veterinarian.

Satisfactory flea control on premises is largely dependent on the adequacy of coverage. Treatment of the anmial and its quarters alone frequently may not eliminate an infestation because the insect also is breeding at other sites on the premises. When these breeding sites remain untreated, the result is poor control, a condition which may be ascribed erroneously to resistance rather than to inefficient operations.

ROACH CONTROL

Resistance to chlordane is present in German roach populations in many parts of the United States. The problem is general in the South and resistant *Blattella germanica* have occurred in several northern cities. Control of resistant roaches can be accomplished by the use of organophosphorus insecticides al-

though none of these materials apparently give the level of abatement formerly achieved with chlordane. Malathion, Dipterex, and Diazinon are effective against *B. germanica* but both Dipterex and Diazinon are restricted to use by pest control operators only. Diazinon is used at 0.5 percent strength, Dipterex at 1.0 percent, and malathion at 1 to 5 percent (as spray or dust). A combination of malathion (1 part) and perthane (2 parts) also is suitable for resistant roach control when used at a 4 percent level. With all toxicants, a spot treatment is used, the pesticide being applied to the cockroach harborage areas and runways, such as cracks and crevices, behind and along baseboards, and around water pipes.

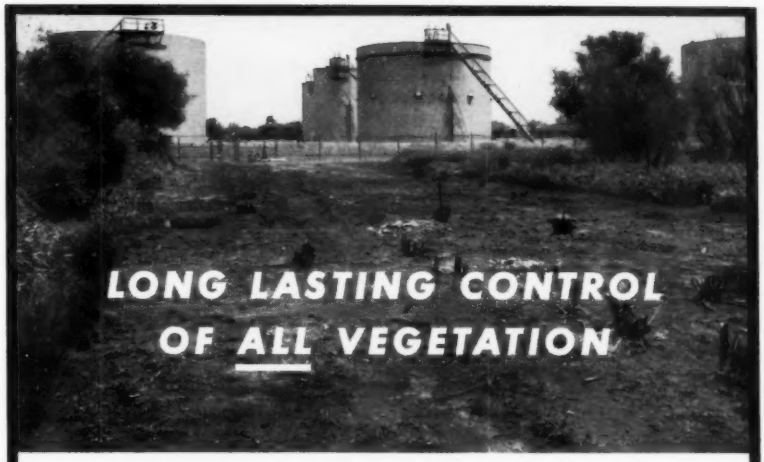
Sodium fluoride and pyrethrum (1.0 percent pyrethrins) dusts also are of value against resistant German roaches.

Where *B. germanica* is not resistant to chlordane and in the control of other species of cockroaches, chlordane as a 2.5 percent emulsion or solution, and dieldrin as a 0.5 percent solution or a 1.0 percent dust are the insecticides of choice. To attain a rapid kill of heavy cockroach infestations, the use of aerosol formulations containing pyrethrum alone or in combination with a chlorinated hydrocarbon insecticide is of value.

BED BUG CONTROL

As bed bug resistance to DDT is not widespread, this pesticide continues to be the insecticide of choice for the control of *Cimex* spp. An application of 5 percent DDT emulsion or solution to the baseboards, wall crevices, bedsteads, and mattresses of infested rooms usually give excellent control of these insects.

Where DDT-resistant bed bugs are encountered, lindane (0.1 percent) or malathion (0.5-1.0 percent) can be utilized. With either insecticide, the treatment of mattresses and upholstery must be done with care so that only a light application of the toxicant is obtained. Under no circumstances should these materials be soaked with spray. As an added precaution the bedding



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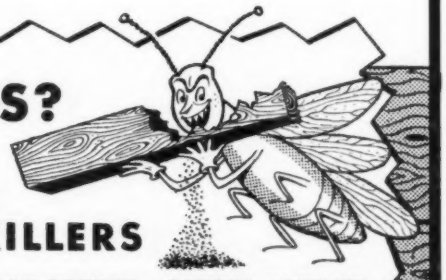

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used by infants should not be treated. Re-treatment of mattresses and furniture should not be made at less than 2-week intervals.

TICK and CHIGGER CONTROL

The area control of ticks can be obtained with applications of several chlorinated hydrocarbon insecticides. DDT, chlordane, dieldrin, and toxaphene at rates of 1.0 to 2.0 pounds of toxicant per acre or BHC (gamma isomer) at a rate of 0.5 pound per acre give effective abatement of ticks under field conditions. Sprays (supensions or emulsions) or dust formulations of these pesticides produce similar results. The level of control secured is dependent on the adequacy of the coverage, in brushy areas 50 gallons of spray or 40 pounds of dust are required as compared to approximately half those amounts in sites of thin cover. Treatments with these chemicals usually prevent reinfestation for 30 days or more.

Ticks, principally the brown dog tick *Rhipicephalus sanguineus* occasionally invade dwellings and cause severe annoyance problems to the occupants. Formulations containing 3 percent chlordane, 5 percent DDT, 0.5 percent dieldrin, or 0.5 percent lindane are effective against this species. These pesticides should be employed as spot treatments to baseboards, floor and wall cracks, and other harborage sites within the house as well as to the sleeping area of the dog. In areas where the control of this tick by DDT and chlordane sprays has not been satisfactory, lindane applications have given good results.

For controlling area infestations of chiggers, the locality should be treated with toxaphene or chlordane at 2.0 pounds per acre, lindane at 0.25 to 0.5 pound per acre, or dieldrin at 0.5 to 1.0 pound per acre. Either spray or dust formulations can be employed with special care being taken to insure thorough coverage of the area.

RODENT CONTROL

The importance of sanitation, including proper garbage disposal, food storage, harborage elimination, and ratproofing, must be emphasized. Sanitation is essential to the permanent control of commensal rats and mice, and the use of rodenticides should be regarded as supplementary to sanitation.

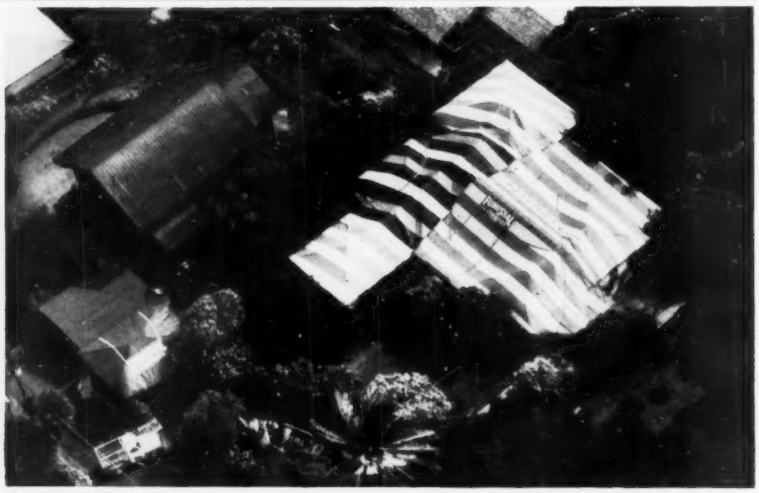
The situation with regard to rodent control is quite encouraging, since rats, unlike insects, do not appear to have developed resistance to the available poisons. The slow-acting rodenticides, including warfarin, pival, coumachlor, and fumarin, are preferred for use in most situations because of their effectiveness and low degree of toxic hazard to humans and useful animals. Of this group, warfarin and pival have had the widest use in this country.

● Warfarin

It has been shown that the susceptibility to warfarin of the various species of commensal rodents differs. Accordingly, in the interest of economy and safety, the lowest bait concentration consistent with the most effective control should be used.

Dependable control of the roof rat *Rattus rattus* requires the use of a concentration of 0.250 mg. of warfarin per gram of bait (0.025 percent). However, field tests have shown that a concentration of 0.050 mg. per gram (0.005 percent) is effective for control of the Norway rat (*R. norvegicus*). Mice react in the same general way as Norway rats, although they show more individual variation. There is evidence that under certain conditions Norway rats may be controlled a little more rapidly, though no more surely, by using 0.100 mg. of warfarin per gram of bait instead of 0.050 mg. per gram. There is a real opportunity for those associated with city and county programs to determine, by careful operational observations, which of these two concentrations is the more desirable for use in organized control campaigns. However, where the species of rat concerned is not definitely known, the 0.25-mg.-per-gram concentration should be used. Commercial preparations generally contain 0.5 percent warfarin in corn starch. To obtain the 0.25 mg.-per-gram concentration (0.025 percent), 1 pound of concentrate is diluted with 19 pounds of bait.

Warfarin baits may be used for initial rodent control under essentially all conditions, using a minimum baiting period of 2 weeks. Consideration should be given to establishing permanent bait stations for control of rats in places which are subject to reinfestation. Two years of experience at Savannah, Georgia have shown that Norway rats can be controlled in non-ratproof buildings so long as poisoned bait is available, but eradication was not achieved. No difference in the residual effectiveness of the 0.100- and the 0.050-mg.-per-gram bait concentrations was observed. The bait stations were inspected approximately every 6 weeks and



"Peppermint" tarps in Hawaii. Fumiseal Company, Honolulu, run by PCO Ernie Forde, uses gaily-colored tarpaulins of red and white strips, to cover the buildings it fumigates for termites.

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fresh poisoned bait was supplied.

● Pival

Pival (2 - pivalyl - 1,3 - indandione), appears, in a general way, to be approximaely equal to warfarin in its rodenticidal effectiveness. In both laboratory and simulated field tests, the acceptance of pival baits by roof rats, Norway rats, and mice has been good. Laboratory tests showed that pival and warfarin were about equally good for mouse control. Against roof rats, pival was shown to be slightly better than warfarin in the laboratory and about the same under simulated field conditions. Both laboratory and simulated field studies indicated that pival in solid bait was somewhat inferior to warfarin for control of the Norway rat, but that pival-poisoned water (0.006 percent acid equivalent) with 5 percent sugar as an attractant was slightly more effective against this species than a comparable formulation of warfarin (0.005 percent acid equivalent). Pival concentrations in solid baits should not be less than 0.025 percent.

Corn meal, as well as some of the other ground grains, has proved to be a good bait material for use with rodenticides which require repeated acceptance over several days. However, in many areas the meal becomes insect-infested after several days of exposure and must be replaced at frequent intervals with fresh bait in order to assure continued acceptance by rodents. Pival has been found to inhibit the development of a number of insects that infest grain, including flour beetles (*Tribolium* sp.), cigarette beetles (*Lasioderma serricorne* (F.)), saw-toothed grain beetles (*Oryzaephilus surinamensis* (L.)) and flour moths (*Ephestia* sp.). Cockroaches, however, were not affected when fed for 30 days on bait containing 0.25 mg. of pival per gram of bait.

● Antu

ANTU still holds a definite place as a quick-acting poison for the Norway rat. Its use to reduce large populations rapidly may be followed by the use of anticoagulant rodenticides to achieve complete and lasting control. ANTU should not be used against the same populations more often than about once a year. It induces a persistent bait shyness in rats, and this property makes ANTU ineffective for repeated use against the same rat population. ANTU is not effective for the control of roof rats or mice. Its safety record is good and it may be used in residences and food-handling establishments. The concentration generally employed in solid baits is 2 or 3 percent.

● Sodium Monofluoroacetate (1080)

Sodium monofluoroacetate (1080) is still the most effective, fast-acting rodenticide, but its extreme toxicity to man and animals requires that it be used only on certain types of premises and only by carefully trained crews. The precautions necessary for the safe use of 1080 are numerous and involved. They are described in the "Operational Memoranda on Economic Poisons" issued by the Communicable Disease Center.

● Baiting Problems

In tests in Savannah, Georgia, corn meal has proved to be the most readily accepted cheap bait. In general, any available cereal may be used as bait material. It is worthwhile to restate that under certain conditions it is very difficult to get rodents to take any bait, e.g., where food is available in great variety and abundance, as in some warehouses. Such conditions constitute baiting problems, a term which implies that the origin of the difficulty lies not in the particular poison used but in the ecology of the rodents themselves. Obviously, in testing any given rodenticide formulation, it is necessary to be certain that apparent failure of the formulation is not caused by baiting problems. These problems can be solved effectively only through extensive knowledge of the habits of the rodents. Such problems do not occur more frequently when simple cereal baits such as corn meal are used than when complex bait mixtures are used.

North Carolina PCA Officers elected at January meeting and PCO conference (left to right): David Dodd, Jr. board member; Ivey Coward, vice-president; Miss Delia Copley, executive secretary; Roy Goforth, president, and T. M. Gunn, another board member.

NC PCOs Told VA Won't Accept Gratis Termite Inspection Reports

Industry members at this year's PCO school, held at North Carolina State College in Raleigh, January 16-17, learned the Veterans Administration expects termite operators to get paid for inspections they make of homes to determine the extent of wood destroying organisms present. In fact, the VA will not accept an inspection report of this kind unless a charge has been made for the service, according to H. A. Ficken, chief of the VA's appraisal section, loan guaranty division in Winston-Salem, N.C. The VA in this district has special forms which can be obtained from its office by PCOs interested in this kind of work.

Mr. Ficken stressed the importance of making thorough inspections for wood destroyers and reporting findings fully on homes coming under VA loans.

Approximately 130 attended the meeting which gave major emphasis to termite control. There also were speeches on recognition

(Continued on page 60)

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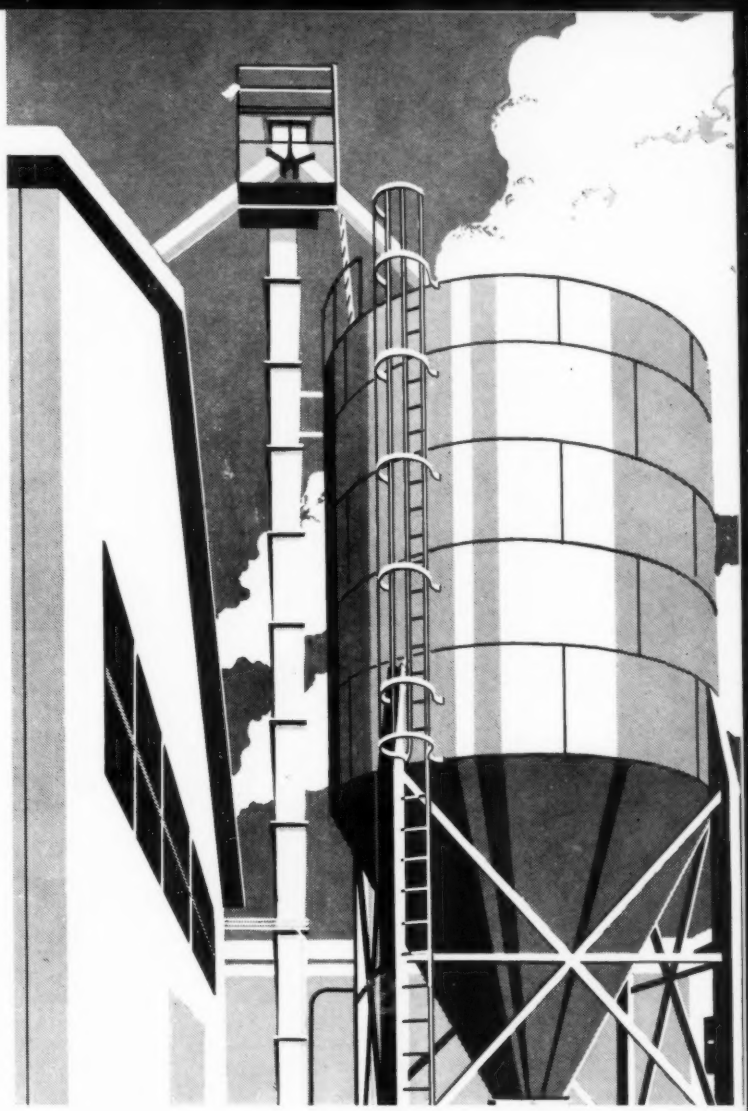

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Avoid Pesticide Contamination of Food, Dr. Decker Tells Industry At Purdue

Forecasting the probability PCOs will be judged liable for the presence of insecticide particles in food thus contaminated and seized by the Food and Drug Administration, Dr. George C. Decker warned, "PCOs have little or no choice but to adopt methods and procedures that will preclude the possibility of food contamination" resulting from the application of pesticides.

Dr. Decker, who is head of the economic entomology section at the Illinois Natural History Survey in Urbana, spoke to better than 360 delegates attending the 21st Annual Purdue PCO conference held on the university's campus in Lafayette, Ind., January 28 through February 1. He explained the relationship of PCOs to the Miller Bill (Public Law 518) and other food and drug laws.

The Food and Drug Administration, through its Food, Drug and Cosmetic Act of 1938, wields a "double-edged sword" over food processors, he observed. "On one hand it demands perfection in the control of insects and other pests, and on the other hand it insists this must be accomplished without in any way jeopardizing the safety and wholesomeness of our food supplies." Any insecticide or other objectionable chemical substances found in finished food products will not be tolerated by FDA inspectors.

If a PCO helps a food processor out of a spot by solving the insect problems that brought on trouble with the FDA, may the PCO be assuming some, if not all, of the food processor's liabilities involving pesticide residues? Dr. Decker feels "every person using pesticides is responsible for seeing the public health is not endangered." That includes the PCO.

Even though regulatory legislation dealing with pesticide residues will become increasingly important to PCOs, Dr. Decker guessed the more frequently discussed Miller Bill will not have any great bearing on the average operator, except as he is engaged in agricultural pest control, such as spraying crops. Instead, he advised this industry to concentrate its attention on the "food additive bills" that will come up for consideration in Congress this year. The Miller Bill deals only with pesticide residues on raw agricultural commodities.

"Thanks for your excellent advice," Purdue dept. head, Dr. John V. Osmun, left, says to colleague from Illinois, Dr. George C. Decker.

The average PCO should be greatly concerned over how his control methods stack up under this Act's jurisdiction of food after harvest, and be doubly sure his operations are beyond suspicion, Dr. Decker advised.

But the prospect of an impending extension of FDA legislation has a bright side, even though "we may encounter difficulty in separating the ghosts from the Santa Clauses." Who directly or indirectly sends PCOs more business than the Food and Drug Administration? Dr. Decker asked. Both the FDA and the PCO have a common goal - protection of the nation's food supply. "It is doubtful if either can succeed without the aid and support of the other," he reasoned.

• Safe Use of Organic Phosphorus Insecticides

Potential toxicity to the PCO repeatedly exposed to some of the newer organic phosphorus compounds was another phase of the emphasis on safe control practices. Dr. Wayland J. Hayes, toxicologist from the Communicable Disease Center's Savannah laboratories, told delegates safety is one of the primary considerations involved in selecting a chemical to solve a particular pest control problem.

Resistance is forcing the industry to turn to more toxic pesticides, some of which are specific for the insect difficult to eliminate. PCOs must avoid the temptation to apply these powerful chemicals more widely when less toxic materials would give control in most cases.

Dr. Hayes gave, in the following table, the relative toxic hazard of diazinon and endrin by comparing their oral LD/50 value for the male white rat with corresponding data for some other well-known compounds.

Compound	L/D50 Value for Male Rat (mg/kg)
Malathion	1375
Chlordane	335
DDT	113
Diazinon	108
Endrin	17.8
Parathion	13.0

From this data it can be seen endrin approaches the high toxicity level of parathion which has caused 28 deaths in the United States alone. A recent paper from England (see pg. 63) reports a number of severe, non-fatal poisonings among people who ate bread made from flour contaminated with endrin residues left in a boxcar used to transport flour sacks.

Improper use of dieldrin in Venezuela resulted in the poisoning of some public health workers who repeatedly applied the chemical at a high rate, Dr. Hayes reported. "Dieldrin can be used safely according to prescribed recommendations, but should not be used as drinking water," the toxicologist jokingly pointed out to stress the need for handling this pesticide with respect.

The toxic action of this new group of compounds results primarily from their ability to inhibit the enzyme cholinesterase, hence the test for blood cholinesterase level provides a useful index of exposure to such materials. Cholinesterase testing should be provided by skilled medical personnel trained to evaluate the differences normally found in different individuals.

• Poisoning Symptoms

There are four major symptoms of organic phosphorus insecticide

Rodent control experts and toxicologists who appeared on Purdue program to advocate wise use of all pesticides (left to right): Glen Crabtree, W. D. Fitzwater, Galen Oderkirk, Dr. Wayland J. Hayes, and Justus Ward.

poisoning, the presence of any in a person exposed to these chemicals should be brought to medical attention:

1. Little or no primary irritation or sensitization.

2. Muscarine effects (nausea, vomitting, abdominal cramps, anorexia, sweating, salivation, constricted pupil, pulmonary edema, cyanosis).

3. Nicotine-like effects (fasciculations, muscular weakness).

4. Central nervous system effects (giddiness, apprehension, headache, ataxia, tremor, disorientation, paresthesias, convulsions, coma).

• 1080 Poisoning

Justus C. Ward, whose job with the U. S. Department of Agriculture is to approve pesticide labels so such products will be used safely, warned PCOs at the university-sponsored conference, "familiarity with poisons and what they do tends to make us too complacent" about their potential hazards.

Citing the rodenticide sodium fluoroacetate (1080), Mr. Ward said that during the 10 years this pesticide has been available, PCOs have been responsible for the deaths of four persons. This comprises between 20 and 25% of all 1080 fatalities. In addition, there have been five proven deaths and three suspected deaths traced to small children drinking 1080 solution from, or chewing empty souffle cups containing residues of the poison which had dried.

"The expert who is entitled to handle 1080 must be mentally alert enough to anticipate trouble and avoid exposing the poison in a way which would invite disaster," he advised. And "above all, he must stop 'donating' samples of the solution to the client who says, 'Sure, I know the stuff's poison, but I'll take care of the bottle.'" Sad experience has shown the well-intentioned layman too often stores the poison, unlabeled, in some place where it can be picked up before he gets around to using it.

Because PCOs are legally responsible for "incidents" involving the use of 1080, Mr. Ward recommends operators read and re-read frequently recommended methods for its use. They are available in booklet form from Tull Chemical Co., Oxford, Alabama. Ask for Technical Bulletin No. 1, "Instructions for Using Sodium Fluoroacetate (Compound 1080)."

• Resistance: A New Insect

Although "pest of the year" at this year's five-day meeting was the cockroach, four of the six concurrent sessions on the subject were devoted to difficulties PCOs are having controlling roaches with previously-successful insecticides, and to the increasing resistance of insects in general.

What's the true significance of resistance to the PCO? Dr. Ralph E. Heal, executive secretary of the National Pest Control Association which assisted in presenting the total conference program, answered by telling industry members, "The advent of resistance is really a boon to our industry. Householders can no longer get control with chemicals they buy at the local grocery store, so must turn to the PCO who has the know-how, time, and chemicals to do the job correctly."

Actually, he said, resistance is bringing a "new insect" to our industry. PCOs must treat resistant insects as though they were a new species. "Forget old control methods and go after the problem in the same way you would attack any new control problem."

While resistance of insects is not new, having been first reported in 1914, the present concept dates from 1947 when houseflies were first reported to tolerate control measures.

Today, housefly resistance is world-wide. Although much emphasis has been put on controlling resistant German roaches, field reports indicate less than 25% cannot be controlled by the chlorinated hydrocarbons. Dr. Heal urged the industry to pay more attention to the remaining 75% of the German roaches that can be controlled by conventional methods in order to reduce the chance they too may become resistant. "Be sure you do a thorough job each time you service a roach account. Use a pyrethrum aeosol to flush out any roaches which may be present, or to see if they're present. There no longer is any place for the 'spritzing' treatment by quickly squirting roach sprays here and there in places you've previously known roaches to habit. You'll save a lot of future trouble by being sure you get every roach on every routine service call," Dr. Heal said.

Fleas appear to be resistant across the country, and bedbugs are becoming slowly resistant country-wide. All along the southern border of the United States, the brown dog tick is not

Largest registration in 21 years is claimed for this year's Purdue conference.

being controlled by former chemicals.

Reports from the Savannah, Ga. - Orlando, Fla. areas indicate flies are following the trend first reported from Denmark, that of being resistant to phosphorus baits.

Presently, the NPCA feels sodium fluoride and diazinon will control resistant roaches; and it's diazinon for the tolerant brown dog tick problem. Malathion is working on resistant bedbugs. Commercially-prepared parathion-treated cords may be of some value, the NPCA says, for controlling resistant houseflies. Users must wear gloves and insist sanitation be reasonably good. The cords can be hung outside food storage areas and inside general warehouses.

• How Resistance Developes

Dr. Heal reported two conditions were needed to develop resistance. First there must be individuals that are different from the rest of the normal insect population, like a solitary black sheep in a flock of white ones. Secondly, there must be something to screen the different individuals from the normal group. An insecticide which kills non-resistant roaches and leaves the resistant ones is just such a screening agent. Resistance is transmitted genetically, he said.

And, there are two types of resistance: that which is physiological and that which is behaviouristic. In the first type, an insect has the ability to prevent an insecticide from killing it after it has received the chemical. In the other type, the insect is repulsed by an insecticide application before ever contacting it.

• Goodbye Marginal PCO

"Resistance of German roaches has brought an increase in business for PCOs in the South, and is causing some smaller, marginal PCOs to go out of business since they are usually not willing to study control methods now that former chlorinated chemicals do not provide an easy control tool." That's the observation made by James M. Sims of Cardinal Pest Control Co. in Montgomery Alabama, who, with Clayton Wright, C. Wright Associates, Dallas, Texas, discussed modern techniques in cockroach control.

Mr. Sims doesn't have specific methods for the control of different species of roaches. He described a procedure that he says controls them all.

"You cannot expect an immediate kill with the organic phosphates, such as malathion or diazinon, because roaches may continue to crawl about for a week to three weeks after treatment. To overcome this," he explained, "we use a two-row crank-type duster, a residual sprayer, and a Madewell steam-heat sprayer. We put .5% dieldrin or 1% DDT dust in our duster for use outside the house

"Show me the way to go home" cartoon illustrated roaches wander anywhere. PCOs Dr. Harlan K. Shuyler (left) and Arthur Gibson reviewed characteristics of common roaches.

and for dusting between walls. I mix 6 ozs. of 25% emulsifiable diazinon with 4 ozs. 46% chlordane in one gallon of water. My men are instructed never to inhale diazinon, to wash their skin if there is accidental contact with the formulation, and never to apply it where there is exposed food or dishes.

"Every drawer in the house is removed and the area behind it sprayed. Wood furniture is also completely wetted. The Madewell flash-boiler sprayer, which takes 8-minutes to heat up, is filled with AA grade thiocyanate in oil, and the resulting chemical jet stream is applied to flush out infestations behind mirrors, and any other difficult-to-get-at places. The thiocyanate really irritates the roaches, knocks them down, and makes them contact our other roach formulation."

• Recommended Roach Chemicals

Dallas PCO Wright preferred to make chemical recommendations for the control of each major roach species.

For **American roaches**, he suggested phosphorus paste bait applied with a spatula or flexible knife blade to spread a thin layer in proper places, or applied to paper or potato slices and placed or thrown in areas that cannot otherwise be reached. "We use 20 to 50% DDT dust and blow it with a hand or electric duster whenever such dust can be used. Two other chlorinated hydrocarbons: 5 or 10% chlordane and 1½ or 2½% dieldrin dust can also be used." Chlordane at 2% and .5% dieldrin emulsion or solution are effective for short periods where the American roach can contact the chemical.

Brown-banded roaches can be controlled with 2% chlordane, .5% dieldrin, and .3% lindane, Wright says. "We treat areas for brown-banded roaches by going into a room and treating it in a clock-wise fashion: baseboards, moldings, behind pictures, clocks, under furniture, davenports, under tables, ironing boards, radios, backs of TV sets, dressers, etc. You end up spot-treating everything in the house."

Since **Oriental roaches** like moist conditions, Wright reports he has found wettable 50% DDT and 50% wettable dieldrin dust, blown into places they inhabit, gives long residual control.

The phosphates are chosen by this Texas operator for **resistant German roach** control. He prefers Malrin, 1% malathion, and .5 to 1% diazinon, used with prime attention to safety. For some unexplainable reason, diazinon seems to break-up on metals and is not effective on them. In his area, Wright says dust formulations of 1 part sodium fluoride to 3 parts pyrethrins, or a 1 to 4 mixture, are widely used to control resistant German roaches. One has to make thorough applications of the formulations if results are to be realized, and the operator may find his nasal passages will be irritated and bleed. "Most operators in my state use both roach powders and the phosphates on the same job."

All the while PCOs are switching chemicals to find those which will give control of resistant roaches, scientists in the laboratory are searching for new pesticides and testing ones yet to be registered. William Butts, graduate student working on an NPCA resistant roach research project at Ohio State University, reported on his work and reviewed the paper he gave at the national association's '56 convention (PC October '56, pg. 25). In more recent investigations, Mr. Butts is finding American Cyanamid's 4124 gives good residual control of both resistant and non-resist-

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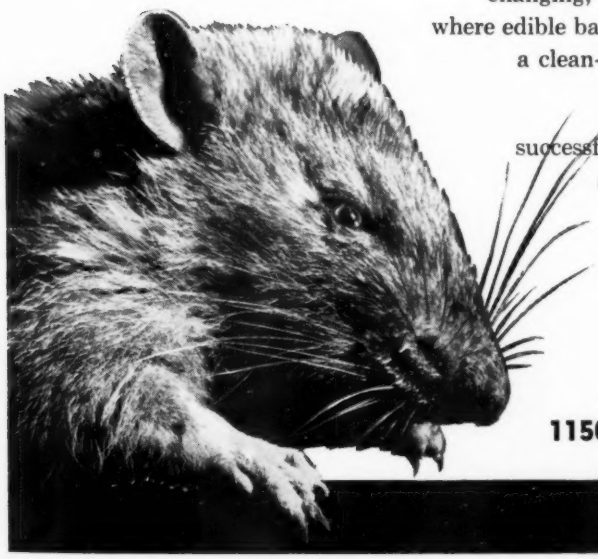

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ant roaches, but concentrations are 4-times those found in normal concentrations, and there is a pungent, bad odor connected with present formulations. The pesticide is not registered for commercial sale.

• Roach Habits Changing?

A difference of opinion exists among qualified entomologists over the possibility that the habits of resistant roaches may be different from their predecessors who were more easily controlled.

Two PCOs, Arthur W. Gibson, Sentinel Laboratory in Springfield, Ill., and Dr. Harlan R. Shuyler of Conservation Industries, Kansas City, Kansas, lead discussions on the habits and habitats of roaches. Dr. Shuyler, who gave his views in Pest Control's September '56 issue, page 9, believes the new, resistant species may be doing things differently than they did before.

German roach populations appear to be more scattered in the north-central states, Harlan Shuyler reported. "Their action is similar to that of the brown-banded roach and is also found more frequently out-of-doors. Oriental roaches seem to be found more often on upper floors during recent months," he says.

Normally, Gibson and Shuyler agree, roaches have a rhythm of action that can be predicted, but some are non-conformists.

Normal roaches avoid light, possibly because the presence of light reduces a preferred amount of moisture. They don't like to be "fenced-in", needing space in which to move about quickly. Their diet is about the same as man's, but they will also cause damage to plantings in greenhouses. Roaches wander about from place to place, living in both extremely dirty and very clean places, but they will avoid dirt-dust.

The speakers recommended all PCOs study the habits of each roach species so they can be controlled more effectively. One publication mentioned as a valuable source of information is the 74-page, report by Louis M. Roth and Edwin R. Willis on "The Reproduction of Cockroaches". Containing many excellent photographs, the report is available from The Smithsonian Institution, Washington 25, D. C. Ask for Publication No. 4148, dated June 9, 1954.

Because recognition of roach adults, nymphs and eggs, as well as a knowledge of their life histories makes control easier, two conference periods were devoted to such study. Members of the Purdue entomology staff, Dr. Howard O. Deay, Dr. George E. Gould, and PCO Robert E. Berns, of Aerosol Engineers in Chicago, supervised this part of the program.

• Quickie Control Tips

One opportunity popular with PCOs at any meeting with experts is the chance to get help on control problems. The "open quiz session" at Purdue this year proved to be typically received. Six industry representatives formed a panel at which the questions were fired: Dr. Philip J. Spear, NPCA technical director; Ira Hatfield, Wood Treating Chemicals Co., St. Louis; Bernie Berger, Able Pest Control, Springfield, O.; Charles Kyle, Extermital Termite Co., Dayton, O.; Karl Hassler, Neil A. Maclean Co., Los Angeles, Calif.; and Arnold Mallis, Gulf Research & Development Co., Pittsburgh, Pa. Purdue extension entomologist, Glen E. Lehker moderated the program.

Here's a quick listing of the insects involved in the questions asked from the floor, and the answers provided by the panel:

Clover mites: For their control outside, apply large volumes of .5% malathion. Customers should also be requested to keep the grass at least three to five feet from the foundation and plant a few ornamental bushes in that dirt area. Inside, Chlorobenzilate gives control in some cases, but where it doesn't, give the customer a pyrthrum aerosol bomb so she can keep them under control.

Resistant brown dog ticks: Diazinon is said to give control, but in indoor applications, limit use to spot treatments. Rotenone powder is helpful when cats are involved. Diazinon should not be used on cats. No matter what is applied, animals should always be removed from the premises before treatment begins.

Fruit flies: These may be mistaken for **moth flies** which frequent drains. To control moth flies, drains must be opened and scum-like material removed. Sometimes mopping of floor leaves a gelatinous breeding material in floor cracks, or the mop itself may be a breeding source. Fruit flies breed generally in

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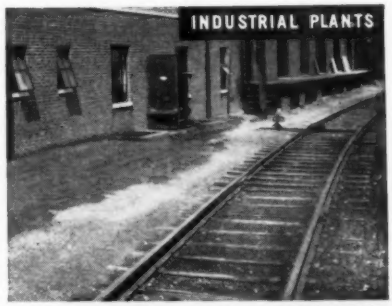
"Telvar" weed killers are easy to use, too. Simply mix them with water and apply with your regular spray equipment. They are non-flammable, non-volatile and non-corrosive to equipment.

Du Pont is telling industry about "Telvar" and suggesting the services of custom sprayers to apply it through advertisements in industrial and business publications.

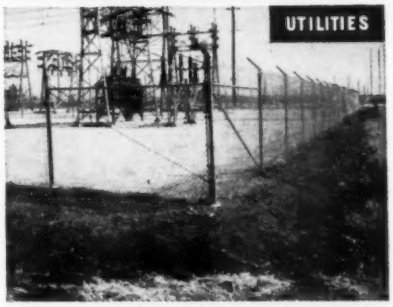
To help you build weed-control business, Du Pont has available new and colorful sales aids. For more information, write the District Office nearest you listed below.

Oilmen know the value of weed control to reduce fire hazards around tanks, refineries and pipelines. "Telvar" weed killers give the economical long-term control they like.

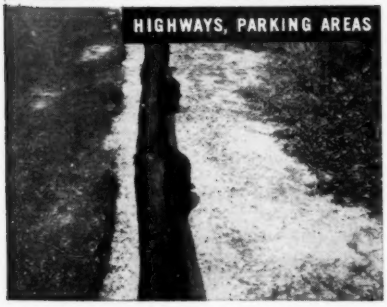


There are many opportunities for weed-control service in industrial plants. Just one application of a "Telvar" weed killer kept this area free of vegetation for more than a year.

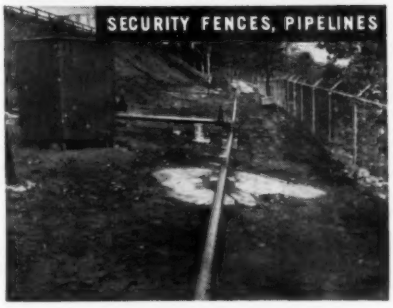
Storage areas usually have heavy weed growth. This illustration shows the kind of thorough control you can offer with "Telvar" weed killers.



Utilities use weed-control service for their various installations. A "Telvar" weed killer was applied just once around this substation. The treated area is still bare—6 months later.



Chemical control is rapidly replacing costly hand maintenance in highway and parking areas. One application of a "Telvar" weed killer brought this result.



Where there are security fences and pipelines, there are weeds to control. Treated with a "Telvar" weed killer over two years ago, this area looks like this today.

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Purdue's closed-circuit TV brought business-machine demonstration to delegates. Here PCO Harvey Sturgeon (center) rehearses program.

fermenting materials, but can thrive on ripening fruit. They've been reported coming from old, empty catchup bottles not thoroughly washed. Orthodichlorobenzene sprayed in drain areas gives control of these flies.

Ants in slab construction, where radiant heat is involved, and during cold mid-winter when soil is too hard to take outdoor treatment provides a difficult control situation, especially when the client does not want to pay for a "termite-type" soil treatment. What can be done? One panel member suggested the placement of thallium sulphate ant baits made of 1 part thallium to 500 parts water. These, he said, would give some measure of control until the ground thawed and outdoor applications could be made successfully.

Cluster flies are difficult to control in the home, most PCOs agreed. So did the panel. But the suggested control chemical for outdoor applications was .5% diazinon put around window frames and under eaves. Inside use 5% DDT in attic and around windows. No one can promise complete control of these pests, the experts said.

Basic to all pest control is an understanding of entomology. That's why opening day of this annual seminar is planned for first and second-year registrants who are introduced to the structure, biology, and identification of insects and rodents, as well as recognition of pest-caused damage.

Instruction during this first-day program is provided by Purdue entomology department staffers Glen E. Lehker, Dr. B. E. Montgomery, Professor Emeritus J. J. Davis, Dr. H. O. Deay, Dr. L. Chandler, William D. Fitzwater, and Dr. John V. Osmun, head of the department.

• Business Machines on TV

To give everyone a better view of demonstrations held during the half-day spent on business equipment and office management, delegates were divided into six groups, each with its own room and TV receiving set to witness a showing and explanation of business machines over a closed-circuit TV channel originating from Purdue's own studios.

C. F. Kottmann demonstrated two new National Cash Register Co. business machines, and R. E. Batton, from Remington Rand, explained two of his company's bookkeeping machines. Minnesota-Mining's new Thermo-Fax Secretarial copying machine which can be used to copy letters in 4 seconds, was displayed by Kenneth J. Alexander, company representative.

Moderating the TV program were three PCOs who have mechanized their business operations by the installation of various pieces of equipment from automatic Addressograph billing systems, to postage meters, machine letter openers and folders, and ledgerless bookkeeping devices. They were Harvey L. Sturgeon, Sturgeon Pest Control, Louisville, Ky., William Turrie, Wil-Kil Pest Control, Milwaukee, Wisc., and Robert C. Yeager, Rose Exterminator Co., Cincinnati, O.

• A Few Extra Hours

A few hours, over and above those you're forced to devote to tax and business reporting, spent in self-analysis of your business operation may yield higher returns than many hours on routine work, Dr. Lowell S. Hardin told the session on business management. Dr. Hardin is head of Purdue's department of agricultural economics.

How do you approach such an efficiency analysis? First establish your goal, or objectives, he said. Then "what-to-do decisions" come next, the courses you'll follow to produce income, your business location, the pricing, credit, and guarantee policies you'll establish.

After you've chosen what's to be done and how it's to be done, who's going to do it has to be decided. Who's to be responsible for what? What equipment is to be used, and how? How is accomplishment of your goal to be rewarded? These are but a few of the how-to-do-it questions to be answered.

Emphasizing the need for personal alertness and initiative, Dr. Hardin said self-analysis usually involves (1) keen observation to collect facts; (2) thinking about and understanding why existing methods and procedures are used; (3) the development of new routines by copying and applying principles, by inventing and budgeting; and (4) action to test and use proven developments.

"Try to view your own operations through a stranger's eyes," the economist recommended. "Develop a questioning attitude toward precedent as the only guide to future procedures, work methods, or equipment design. Go visiting to compare with your own the organization, procedures, equipment, etc. of others. Then, take time to train yourself and your employees in the better methods you've picked up. And,

Roach life cycles and identification were taught conferees by Purdue entomologists, Dr. G. E. Gould (left) and Dr. H. O. Deay.

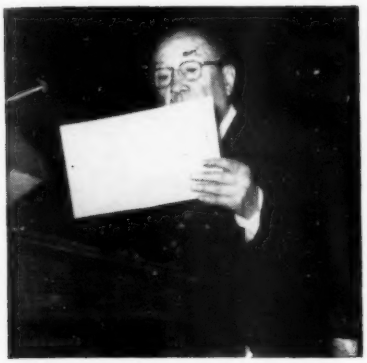
take any small savings seriously, they accumulate!"

• High Wage Level

The present ratio of wage rates to machinery costs favors substitution of machinery and equipment for labor, Dr. Hardin told PCOs. "In the U.S., human beings are especially costly sources of physical energy - power," he said. "Use it wisely. Man is your most important piece of business equipment, so be sure your system of paying workers rewards them for the quantity and quality of work they do. Slightly above average wage rates may hire well above average workers."

• Financial Routing

After you've analyzed your problems and have decided what you're going to do, your course must be plotted on a financial "map" or budget to transfer



Entomology Prof. Emeritus J. J. Davis reads citation presented to 13 ten-year registrants.

your plan into the dollars and cents effect your decisions will have on profit and loss.

Business budgeting takes planning, coordination and control, according to Dr. W. E. Thomas from the University of Illinois' accounting department who urged management to give employees a chance to help make budget plans so they'll feel a part of them and carry them out better because they understand the part they play.

Planning, Dr. Thomas said, enables you to think a problem through and arrive at a better solution than if a decision has to be made quickly on a matter which could have been anticipated. Planning also makes it possible to avoid problems by deciding in advance what action can be taken to avoid them.

The coordination of needs through budgeting gives management the time and the opportunity to anticipate equipment, personnel and cash requirements and to provide for them beforehand.

Budgeting gives you financial control of your business operation by providing a quickly-available reminder of the many fiscal details involved in planned, efficient management, details which might otherwise be forgotten in the course of routine business complications.

Dr. Thomas proposed budgets be made for one year, but broken down month by month and kept flexible enough to make alterations as changes in business plans arise. Each month, actual expenditures and income should be compared with how you've budgeted them so you can better control the ratio between expense and income.

Increasing emphasis on the role PCOs can play in the nation's Civil Defense program brought an official from CD headquarters in Battle Creek, Michigan, to the Purdue Meeting. W. L. Shaffer, rural consultant in the CD technical operations office, told how the program is organized today and that its basic concept is a three-fold one of self-help, help to others, and the maintenance and restoration of production. The Battle Creek headquarters is preparing a special, exclusive report for Pest Control on how and where the PCO fits into present plans.

V. G. Wagner, from the general sanitation section of Indiana's public health department, and PCO R. O. Williams, Aardvark Pest Control, Evansville, Ind., also discussed how the pest control industry fits into national and state CD planning. One major recommendation was a statewide inventory of equipment and material that would be available for rescue and preventive work.

Some of the problems that may arise during the first month after an atom attack and the introduction of bacteriological warfare by enemy agents includes the presence of typhoid fever, cholera, malaria, encephalitis, yel-

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low fever, dengue, epidemic typhus, plague, and rickettsialpox.

Dr. Philip J. Spear, technical director for the NPCA, and Val Smitter, PCO from Smitter Pest Control Service in Grand Rapids, Mich., outlined some of the industry problems associated with civil defense. Among these is the need to break down the differences between competitors to affect a working corps of PCOs. Another is the possibility members may now be air-raid wardens assigned specific tasks other than pest control, or those in active military reserve programs who would be called into home defense. Both would reduce the manpower available to carry out insect and rodent control needed in the event of an enemy attack.

Fumigation and termite control were covered by (left to right) Karl Hassler, J. H. Davidson, and Myron W. Smith in 3-hour session.

• Tracking Powders Endorsed

Ever since Denver PCO Maurice Oser returned from his European trip last summer and reported the success overseas operators were experiencing with anticoagulant tracking powders in rodent control (PC, September '56, pg. 30), operators in this country have become increasingly interested in applying this technique here. The rodent control branch of the Fish & Wildlife service re-activated its control investigations, and limited quantities have become commercially available to PCOs.

D. Glen Crabtree, from the F&WLS wildlife research lab in Denver, was invited to tell operators at the Purdue conference the basis for his agency's research and the success or failures so far revealed.

"The necessity for a new approach to the problem of commensal rodent control is obvious because of the increasing number of failures of baits, notably anticoagulant baits, when placed in situations in which they must compete with food sources more attractive than the baits themselves," he said.

"The tracking powder approach has been found to offer a way around the dependence upon voluntary acceptance of a lethal agent in a bait, since rats and mice will ingest through grooming lethal amounts of materials which are refused when presented in baits. Apparently, the psychological reaction of ingestion through grooming, in the case of rats and mice, is completely different from that associated with the acceptance of food materials.

"With these facts in mind, the wildlife research laboratory is engaged in an investigation of tracking powders and their application to rat and mouse control," Mr. Crabtree explained.

"This program involves both laboratory and field experimentation. The material selected from the anticoagulant field is PMP at a concentration of 2%. This compound is both a low hazard drug as well as a relatively low-cost compound. The latter characteristic is an important factor in making the use of a tracking powder economically feasible.

"Laboratory and field tests with the 2% PMP tracking powder indicate this formulation when properly applied - and proper application is an extremely important factor - can completely remove infestations of roof rats, Norway rats, and house mice," according to Mr. Crabtree's research.

Proper application techniques include the dusting of a 2% concentration in short patches on widely used rodent runways. It can be applied with a powder duster (being careful to avoid fluffing it into the air) or even with a simple salt shaker. For applications in rat burrows, a Cyanogas foot pump is recommended, but get the dust deep enough into the hole to keep it away from the weather. PMP must be applied in rather dry situations to avoid moisture pick-up by the powder.

Although PMP should not be used in food plants and food contamination is to be avoided, the dust can effectively be applied between walls to control rodents which use this area for harborage and runways, Crabtree said.

• Other Anticoagulants

Other lethal agents are under study as the active ingredients of tracking powders, Crabtree reported. One new anticoagulant now being field-tested by the F&WLS is Diphacinone made by the Niagara Chemical Division of Food Machinery & Chemical Corp., Middleport, New York. Diphacinone is being used at 1/5 the concentration normally used in anticoagulant rodenticides and at this low level, killing action parallels other similar rodenticides with concentrations five times greater. The new chemical is not available commercially.

Animal pest control in suburban areas was briefly discussed by Galen C. Oderkirk and William D. Fitzwater, agent and assistant district agent respectively of the F&WLS station at Purdue. An entire week-long meeting could be devoted to nuisance animals and it was suggested a manual on the control of these pests should be prepared.

• Termites: Slab & BRAB

That more pest control operators are engaged in termite control was proved by the better than 200 who stayed for the final morning session of the conference, a session devoted entirely to control of subterranean termites under and in homes constructed on concrete slabs.

Myron W. Smith, president of both the NPCA and of Hill-Smith Systems in Memphis, Tenn., said TOs need to keep their eyes open at all times to watch how new homes are being bulit, to become acquainted with new building techniques, and to know what construction was used when they may be called upon to treat a similar structure. But even though you may know the methods used by a contractor on one of his homes, you cannot safely assume his methods will be the same throughout every house put up in a tract. Building techniques which may affect termite control often change during the course of completing a development. Because of these slight, unknown differences, treatment may be a trial and error one based upon generally accepted standards.

Slab construction is basically more termite resistant than conventional construction, Mr. Smith said, hence spot treatment of slab homes may be sufficient to get complete control. There is a tendency toward the use of water

(Continued on page 66)

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Eastern Conference Decides Higher Costs Justify Upping Service Charges

There is a need for increasing prices and bettering rates for new work because of the narrowing margin between costs and customer charges, a panel chaired by Jacques J. Hess of Exterminating Services Corp., New York City, told the better than 100 operators at this year's Eastern PCO conference. It was the 17th annual meeting held at the University of Massachusetts, Amherst, January 23-25.

Resistance problems have resulted in higher labor and material expenses. Many firms indicated they had not raised their prices in 5 to 10 years, despite almost annual increases in overhead. A survey also revealed many operators do not avail themselves of the services of either a certified public accountant or other form of professional accounting counsel. The panel emphasized all PCOs, large or small, would benefit by such competent service.

This "price" panel discussion was one of six in which every attendee spent almost an hour during the first day. Other topics covered included rodent control problems, resistance to insects, insurance, termite control and seasonal pests. Leading these sessions were H. A. Merrill of the Fish & Wildlife Service, Dr. John J. Pratt from the Army Quartermaster Research and Development Laboratory, Jerry H. Goodman representing B. & D. A. Weisburger, Philip Mayer, Jr. of Evins Exterminating Co., and John K. Medoff who runs Hudson Exterminating Co.

• Insect Phobias

A plea for cooperation among PCOs and members of the medical profession who may be called upon to help a victim of an itch or insect phobia, came from Amherst physician, Dr. Robert W. Gage. Many operators have been called in to control insects which a client imagined were present. How does a PCO handle such cases? Charles Pomerantz of Bell Exterminating Co. in New York has possibly done more research into this problem than any other operator. He reported several case histories he had encountered.

Dr. Gage defined an itch as a sensation which usually arises in the skin, and is most accurately described as a very small degree of pain.

"As you doubtless already know," he said, "the sensations of touch, temperature, and pain are transmitted from the skin, the site of origin, to the brain by totally different nerve fibres. The sensation of itching is definitely transmitted by way of the pain fibres and apparently results from a very mild stimulation of pain receptors at the skin level.

"It is especially important to understand that itching is a subjective complaint, which may or may not be accompanied by a visible counterpart on the skin. In other words, it is a complaint which only the subject himself is able to evaluate."

Because itches may originate from several external or internal causes, it is important to take time to carefully determine the reason for such a complaint, Dr. Gage advised. This requires time, patience, and cooperation to examine thoroughly, explain your findings, ask for cooperation of colleagues if your client feels your examination is cursory, and to be frank by carefully insisting there are no insects if you have found none.

Dr. Gates does not feel PCOs should superficially spray some chemicals about just to satisfy phobia victims if such applications are not warranted. "There may be a temporary remission of their problem, and temporarily they may be grateful to you for your help, but soon, if the situation is deepseated, it will return," he advised.

Finally, the physician urged PCOs not to make fun of phobia cases. "Your client in such situations is a sick person. It is not funny." He recommended PCOs' unsolved phobia problem clients be referred to their physician and not to a psychiatrist for so many causes of itching are purely medical and not emotional.

Dr. G. W. Wharton, head of the University of Maryland's Zoology department, discussed the Arthropods that may cause itches.

Resistance of insects to many insecticides, earlier given as the reason for rising industry costs, was discussed by Dr. Ralph E. Heal, NPCA executive secretary. (See story on Purdue conference, page 35 this issue.) He warned against the trend towards increasing the dosage of Diazinon to as much as 5% as reported in some areas.

Dr. Pratt, of the army, reported there are at least 10 common insects now resistant to the usual pesticides, and perhaps 37 others suspected.

Mr. Merrill, who spoke before the rodent control panel, suggested increasing dosages of warfarin in higher concentrations, but warned against over-generous applications and use of anticoagulant tracking powders. Several delegates reported they were getting good control of rats and mice with the new tracking powder, PMP.

Typical New England winter cold didn't stop Eastern conference PCOs from posing for picture.

In the laboratory, PCOs were given training in the identification of some 40 insects through exercises prepared by Dr. Harvey L. Sweetman and John A. Weidhaas, Jr., of the university's entomology department.

Chairmen of the three-day conference were Sidney Wimmer, Majestic Exterminating Co., Donald H. Lewis, Orkin Exterminating Co.; and John Medoff, Hudson Exterminating Co., working in cooperation with Dr. C. P. Alexander, head, and Dr. Frank R. Shaw of the University of Massachusett's entomolgy department.

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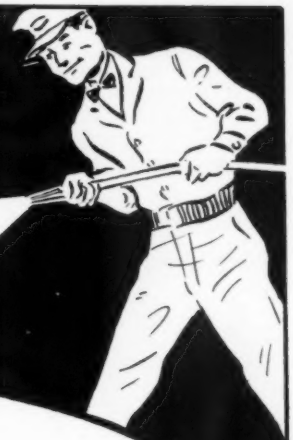

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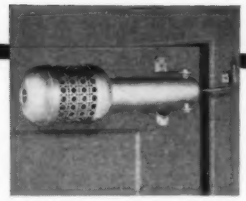

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150 attended 1957 Southern PCO Conference at Louisiana State this year.

Spear Recommends Periodic Physicals For PCOs, at LSU Southern Conference

"One of the most important selling points PCOs have is the careful attention they give to safety which is part of every control service." But, according to Dr. Philip J. Spear, technical director of the National Pest Control Association, operators should follow the American Medical Association's safety program to protect both their employees and themselves.

Dr. Spear was addressing the 150 PCOs attending the 17th Southern Pest Control Operators Conference, held January 28-30, at Baton Rouge, Louisiana, on the campus of Louisiana State University which, in conjunction with the NPCA and the Pest Control Operators of Louisiana, sponsors this annual meeting.

The AMA's program calls for a pre-employment general physical examination to be given to each job applicant. Dr. Spear pointed out such an examination would eliminate men who are careless, allergic to the chemicals they would use, and who may be excessive drinkers.

Second step of the plan is a periodic physical to help maintain the employees' overall health, keep a check on health practices of the industry, and to keep a current record of the effect different materials are having on each operator. Such a record, Dr. Spear said, would be of great value to the medical profession.

Last part of the AMA safety guide is a terminal physical, taken when an employee terminates employment. Not only would this provide information similar to that recorded through periodic health checks, but would also be of value in settling any claim that might later arise against the employer.

Speaking on safety for the PCO, Dr. Spear listed 12 rules every operator should follow:

1. Read and follow suppliers' directions.
2. Use materials only at the recommended rates and dosages.
3. Use pesticides in such a way as to eliminate any residue on food products.
4. Take adequate precautions to protect the applicator.
5. Store insecticides and all toxic chemicals in safe places.
6. Use the least toxic material that will still get the job done.
7. Review your data sheet and check the properties of the material you are about to use.
8. Keep equipment in good working order.
9. Employ care when using equipment.
10. Use extreme care when applying a spray.
11. Beware of drinking alcoholic beverages prior to using toxicants; they impair judgment and increase susceptibility.
12. When transporting pesticides in a vehicle be sure they are clearly labeled for proper identification, and securely fastened down, in case of an accident.

• New Pesticides

In another talk, Dr. Spear brought delegates some of his information on the newer pesticides.

He said Diazinon will characteristically last longer on porous surfaces such as wood, paint, or concrete, but will persist for only a short time on "hard" surfaces like glass and stainless steel. The chemical, if used carelessly, can have toxic effects on the applicator. He should be careful to avoid "bounce-back," "drip" and "poorly functioning machinery."

A second phosphate-type insecticide, DDVP, Dr. Spear claimed, would have limited use in this industry in the near future because of its "lingering" characteristic and extreme potency. One possible exception he mentioned was the application of DDVP in large warehouses containing no food stuffs.

The new fumigant, Sulfuryl Fluoride, from The Dow Chemical Co., does not have the odor properties of methyl bromide and is useful in protecting seeds and grain as well as for the control of dry-wood termites, Dr. Spear observed. Its limitations result from the fact that Sulfuryl Fluoride will attack plants, is 3½ times heavier than air, and must be kept away from food products, he said.

A new and as yet unmarketed pesticide, 4124, produced by American Cyanamid Co., has one built-in safety factor. The technical expert said this product has a peculiarly offensive odor that will keep children and pets at a respectful distance. It's reported to have "a good residual life."

Another new pesticide still undergoing field tests is Diphacinone, an anticoagulant rodenticide of the Niagara Chemical Division, Food Machinery and Chemical Corp. This is a potent agent which must be diluted before use.

• Future Money Maker

Calling lawn maintenance work "a great future money maker," duPont's T. J. Hernandez told the group year 'round contracts with homeowners will assure operators of a new and regular source of additional income.

He suggested PCOs make notes on the needs of a property owner's lawn and present him a planned program of work for the coming year. This will overcome the customer's reluctance to sign a yearly contract and avoid a call for service at the wrong season.

Hernandez called on operators to have the right equipment and properly trained men to do the job. They should know their chemicals and have "plenty of hose" to reach all parts of the property to be treated.

There are two categories of lawn pests: those which destroy the turf, and those which are merely a nuisance. In the first group are the important fire ant, chinch bug, sod web worm, army and cut worms. Those which cause no lawn damage include harvester ants, mole crickets, ticks and fleas.

• Attack, Fortify, Defend

Military terms such as "attack," "fortify," and "defend" were used by Robert M. Russell.

(Continued on page 64)

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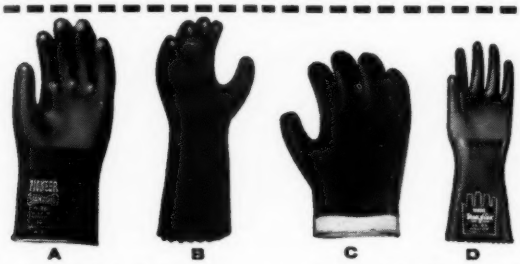

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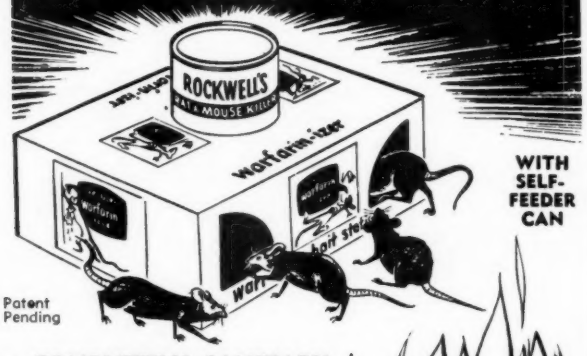

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Municipal Expansion Increases Pest Problems Oklahoma Conference Told

As municipalities grow, so do the number of insect and rodent pest problems, Dr. Ernest W. Laake, entomologist for Dallas, Texas, reported to the 150 PCOs gathered for their 17th annual conference held at Oklahoma A&M College in Stillwater, January 21-23.

In the City of Dallas, he said, one of the problems was filter fly invasion of homes, even though the modern sewage plants from which they originate were some distance away. As cities grow, more demands are placed on disposal plants, and to help solve this problem, more plants are constructed. Even though such plants are originally located some distance from the city limits, rapid growth of the population soon envelopes the sewage disposal works, resulting in migrations of millions of filter flies overrunning nearby homes.

The larvae of filter flies are used in sewage filters, Dr. Laake said, to clean the slime from gravel used in them. A solution he proposed was the introduction of malathion to the liquid just as it is being pumped to the filter beds.

Similar pest problems resulting from the spreading out of America's cities come when small hog or chicken farms, used tire lots, junk yards, and stockyards are surrounded by new housing, he reported.

• Ants and "Slabs"

Paul Hunt, entomologist at Graham Pest Control in Oklahoma City, has found ants in new homes of slab construction present a challenging problem to both PCO and home owner, summer and winter.

Ants most commonly encountered are pavement ants, field ants, fire ants, carpenter ants, Pharaoh ants, and even red harvester ants.

"In our inspection work," Graham reported, "we do not try to identify the ant according to genus and species, but rather as to the place of nesting: soil, wood, or house. When the place of nesting has been determined, the method of control can then be decided.

"We have used three types of control methods in our ant program: poison baits, service at regular intervals with sprays and dusts inside the home, and soil fumigants under the slab." After hearing of the potential dangers associated with soil fumigants under slabs, Mr. Hunt told **Pest Control** after the meeting his firm was discontinuing this technique immediately.

Two baits are used by this company for ant control, one sugar base and one with a grease base. The sugar bait contains 1 lb. sugar, 1 pint water, 3 ozs. honey, 2 grams Thallium Sulfate, and 1 gram Tartaric Acid. Their grease bait is made with ½ gram Thallium Sulfate, 75 grams peanut butter, and 25 grams sweet chocolate.

For indoor sprays a 2% chlordane in water is used because oil-based sprays seem to repel the ant, the entomologist said. The dust applied is a 5% chlordane formulation, which can also be effective for carpenter ant control if it can be placed in nesting cavaties and trails, he explained.

The fumigant formerly used for outdoor ant control beneath slabs was 85% Ethylene Dibromide applied at the rate of one quart to 150 or 200 square feet of area. Because of the hazards explained below, this practice is no longer followed.

• EDB Limitations

Ethylene Dibromide is one of the more toxic gases and is extremely dangerous when used improperly, according to Dr. Robert G. Howe, Oklahoma A&M entomologist. In this, representatives of The Dow Chemical Co. seem to concur (See Purdue conference report, page 64, this issue). EDB is not the final answer to termite control under slabs and use of this material in pest control is limited because of its hazards, Dr. Howe commented.

Any person using EDB must be familiar with the methods used to test for its presence and quantity when it contaminates the air. The flame-color Halide test is not a truly reliable measuring method because of individual differences in determining the various shades of flame color that indicate the quantity of gas present. A truly

(Continued on page 58)

Radio-active tracers help industry study insects. Dr. Philip Specr (left) and Myron Smith examine atomic exhibit at Oklahoma U.

Three PCOs and extension specialist who spoke on Oklahoma short-course program (left to right) W. J. Pinkston, Miss Ola Armstrong, clothing expert, Tom Graham, and Bill Hand.

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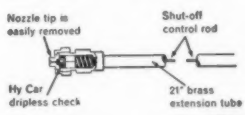

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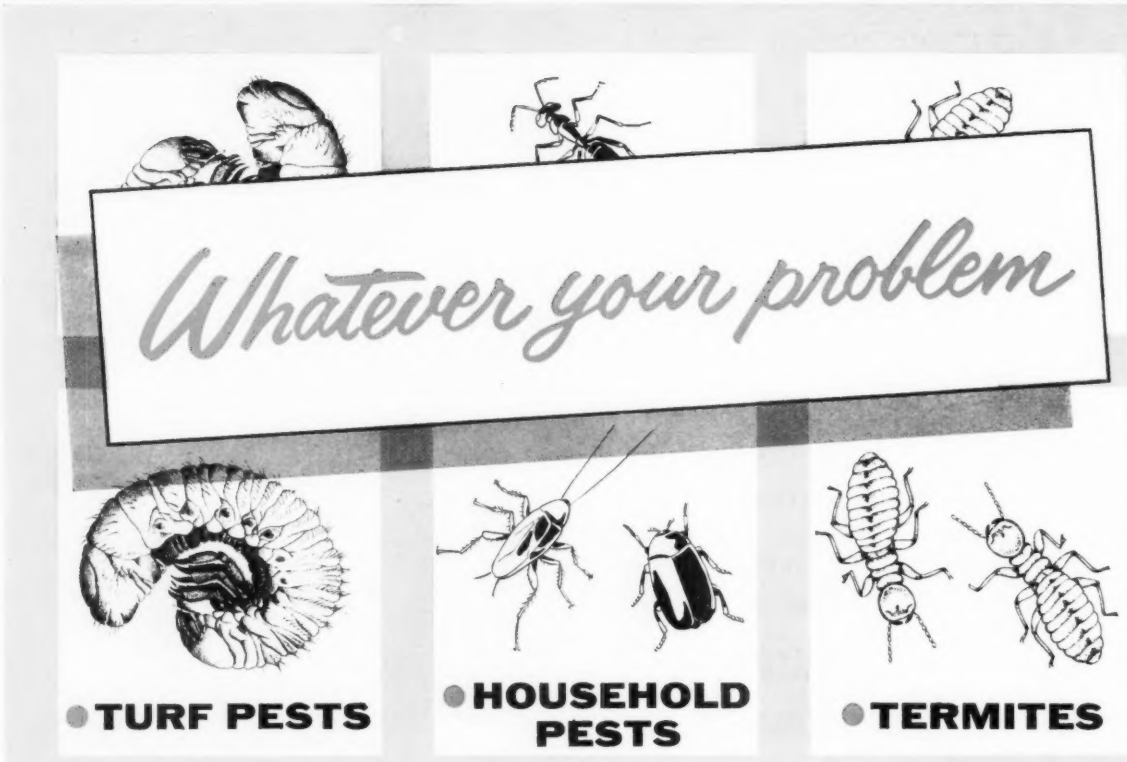

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How Soon Should Slab Be Poured After Application of Soil Poison?

Until recently, no one has challenged the assumed right of housing contractors to pressure termite operators into hurrying their application of soil poisons so the concrete slab, for a basementless home, or for a cellar floor can be poured immediately after the soil has been flooded with a termite chemical. Leading TOs have prided themselves on the ability of their crews to complete chemical ground treatment just minutes before concrete men move in to go to work.

Alfred Zimmern, independent counselor-architect on control of wood-boring insects, from Dallas, Texas, and consultant to the Antimite Co. of St. Louis, questions the wisdom of bowing to such speed-up demands of contracts.

In 1955 (PC, Feb. '55 pgs. 18-44), Philip Mayer, Jr., of Evins Exterminating Co., Great Neck, N. Y., described part of his soil pre-treatment of homes during construction as follows:

"We come in with our flooding operation after the cellar bottoms have been graded, but before the cellar floors and screed coats have been poured. In actual practice the grading is usually done at the very last minute by the concrete men themselves, with the Transit-Mix trucks standing ready to drop their loads. This means our timing must be perfect, and we must work rapidly. Concrete-pouring starts the very instant we are finished."

Last year (PC, Nov. '56 pgs. 36-40), Myron W. Smith, president of the Memphis, Tenn. firm of Hill-Smith Termite Control Co., emphasized the timing contractors expect of termite operators. He wrote:

"It has not really mattered a great deal in the past if our servicemen arrived at Mrs. Jones' home at 9:00 instead of 8:00 as scheduled. But when a builder schedules (our soil poisoning operation) at 8:00, he also schedules his concrete for 8:15 or 8:30." Thus only 15 to 30 minutes are being allotted for the preventive termite control work.

The cover photo on **Pest Control's** February 1957 issue pictured a basementless building in the early process of construction. One half of the dirt area inside the perimeter foundation was being readied for the pouring of cement while servicemen were finishing the spraying of the other half with a termite soil toxicant. This photo was taken on the Purdue University campus where some 38 housing units are undergoing controlled sub-slab soil poisoning experiments to determine the effectiveness of several chemicals and control methods.

Is the termite control operator

Dry-wood Termites' Preference for Moisture

Figure 1. Bloated dry-wood temites feeding on damp wood under saturated atmospheric condition.

The ability of the common dry-wood termite, *Kalotermes minor* Hagen, to exist under arid conditions has long been recognized. In and around populated areas this species occurs in buildings and requires no contact with the soil.

While the dry-woods are known to frequent desiccated wood, it does not necessarily require a dry environment, Prof. Roy J. Pence, of the University of California's entomology department, writes in the *Journal of Economic Entomology*, Vol. 49, No. 4, pp. 553-54, August 1956.

He says observations indicate dry-wood termites show a preference for a more moist environment, but the amazing ability of this insect to adapt itself to extremes of humidity and aridity makes it a successful species under all conditions.

Laboratory experiments have substantiated field observations that dry-woods can be maintained for long periods under normal room conditions, while others can exist for an even longer period under an artificial, moisture-saturated atmospheric condition. Those

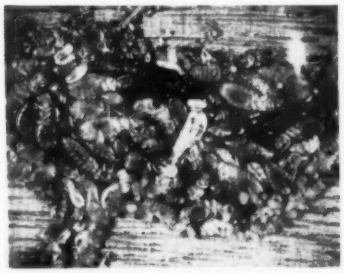


Figure 2. voluntary "packing" of dry-woods to conserve moisture after being subjected to excessive aridity.

living in a humid environment are always long, full-bodied, and bloated as shown in Fig. 1.

The dry-wood termite will utilize a carton of its own manufacture to establish and

(Continued on page 60)

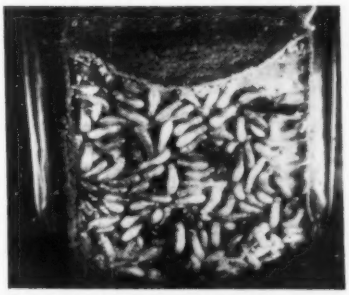


Figure 3. Protective carton built in experimental wood-topped glass beaker by dry-wood termites to seal-in moisture.

correct in assuming he must work under such tight production schedules when applying pre-treatment soil poisons during the construction of a building? Is it in his best interests, or that of the contractor? Does the eventual owner of the finished home get the best kind of protection against a termite attack at some later date? Perhaps the present day "crash" techniques need to be re-evaluated to determine if longer-lasting protection will be achieved through a slower operation.

Zimmern suggests more time should be allowed between the time soil poisons are sprayed on and when the concrete is poured. He says actual application techniques must be tailored to the type of construction involved and that no over-all, standard method can be recommended.

If the builder schedules his concrete work for 15 to 30 minutes after the TO starts to work, what kind of concrete work is intended to be done? Zimmern asks. If it is the pouring of the foundation, no TO knowing his business, and that of building construction, would agree to treat the area **before** the foundation is poured and the forms removed. When the concrete has set by the following morning, stakes, forms, and braces are removed. This operation disturbs the soil and destroys part of the treatment.

Actually, Mr. Zimmern says, the pouring of concrete for a slab-on-ground is not normally done without considerable preparatory work beforehand.

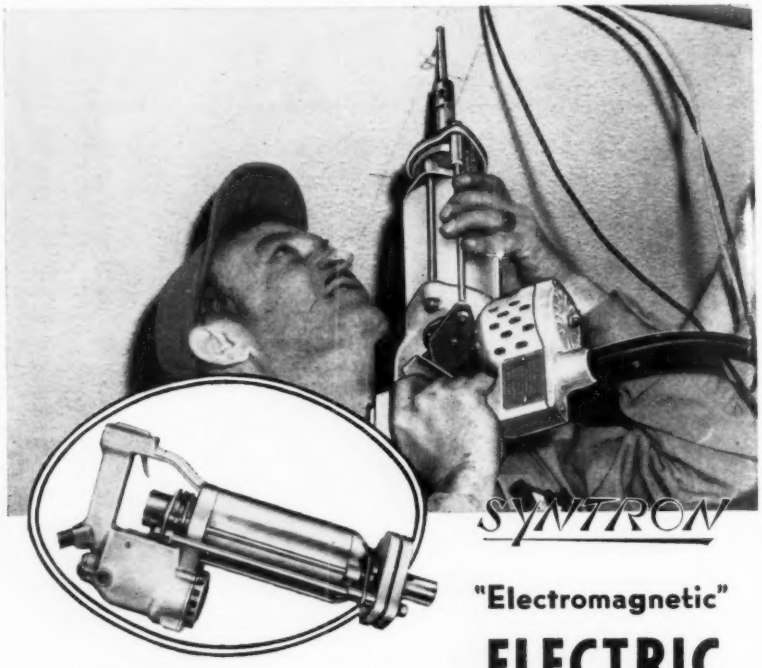
"To properly construct a concrete slab-on-ground, the perimeter insulation, or the expansion joints, must be applied to the inside of the foundation wall. Then a 6-inch tamped gravel fill is placed on top of the treated but undisturbed grade. This requires the top soil to be absolutely dry. The gravel fill serves as a capillarity stop. The membrane vapor barrier is generally placed on top of the gravel, then the membrane vapor barrier, followed by the reinforced concrete slab 4 to 5-inches thick. The grouting coat serves to prevent water from the concrete mix getting into the gravel fill and also prevents any puncturing of the membrane vapor barrier," Zimmern says.

"A TO should not permit any disturbing of the finished soil treatment for at least 24 hours or more," he advises. "One can imagine what kind of a soil treatment would be left after the workmen stomped all over the area with their heavy boots and tamped the gravel fill in place over a grade softened by the chemical treatment. The 'packing' which would result would hinder the toxicant properly penetrating the soil and may result in its being drawn up into the air through vaporization."

Can builders be convinced of the necessity for waiting a day after soil has been termite-treated before pouring their concrete? This change in building practice, which need not delay contractors at all if they schedule their work properly, will have to be substantiated by sound explanation.

Other questions that affect soil pre-treatment are: "Should the toxicant be applied to the soil under a slab, or to the fill? Should gravel fill be treated to prevent termites from moving through it?"

More research needs to be done on this, another of the many problems surrounding the expanding practice of pre-treating soil of buildings during construction.



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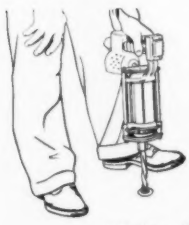

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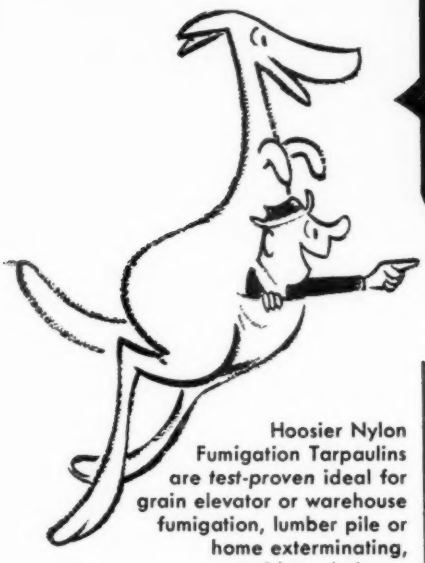

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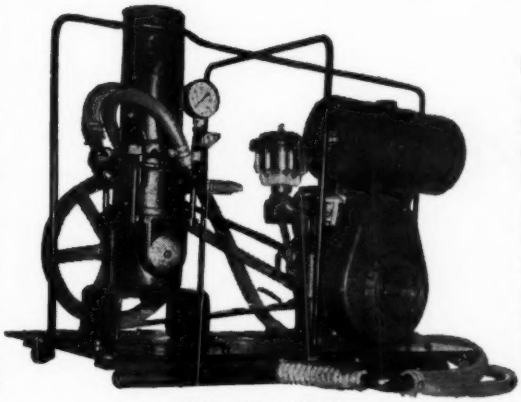

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How Public Health Departments and PCOs Can Harmonize Their Activities

By
DR. LEE C. TRUMAN
Pest Control Services, Inc., Indianapolis, Indiana

Public health laws and ordinances generally have helped build a greater demand for pest control operator services. Laws governing rodent elimination, sanitation in eating and drinking establishments, weed control, purification of milk, and many others, have alerted the public to the need for pest control.

One prime function of a public health department is public education to create an increasing desire for a better environment in which to live. Certainly we should be well satisfied if this aim is accomplished.

There are many fields in which interests of the PCO and a public health official overlap. Efforts in these fields should be coordinated to whatever extent necessary.

Rats and mice, with the many disease organisms they or their parasites carry, are a principal source of disease transmission. PCO efforts to reduce the number of rats and mice in any area, however large or small, cannot help but be a significant contribution towards the improvement of public health.

Roaches are probably as suitable a disease carrier as house flies. They feed on human and other waste. Their habit of walking over food products and foods in preparaation cannot but be suspect of disease transmission.

Fly control, whether by the PCO on individual premises, or by health departments on an area-wide basis, is essential to the improvement of public health.

Bedbugs cause a great deal of discomfort, and sometimes even direct illness, particularly in people especially susceptible to their bites.

Lice and fleas carry many diseases. Their control is a definite part of the public health service.

Mosquitoes are another pest frequently controlled on an area basis by public health officials who remove, control, or treat bodies of water in which these pests breed. Frequently, a PCO does this same work, although quite normally his efforts are confined to the elimination of adult mosquitoes to prevent further breeding.

The control of miscellaneous pests, such as cheese mites and ticks which cause irritation and carry disease, is but another facet of the PCOs' contribution to public health.

• Goal The Same

Both PCOs and public health officials are in specialized fields. Each should thoroughly consider the problems of the other. A PCO's contribution is to the improvement of the environment in which man lives. This is also one of the great functions of a public health department.

I have heard many bitter complaints from PCOs that public health officials in their areas were engaging directly in pest control work which they, the PCOs, felt they should have. I have heard equally bitter objections from the public health officials that PCOs in their areas would not or could not perform the operation in which health department personnel were engaged. I suspect there is probably some justification in each of these accusations.

Many of these misunderstandings on both sides have resulted because PCOs and public health officials have failed to sit down together to discuss mutual problems. Each should take into account the desires, motives, and objectives of the other. Generally, when the subject is discussed jointly, we shall find we have many, many more points in common than we have at difference.

I quite agree public health departments should not engage in pest control work which a commercial operator can do as well or better. I am likewise of the opinion a PCO should not encroach on the field of public health.

• To Stop Spread of Disease

Transmission of a communicable disease has four requirements: **(1)** a causitive agent, **(2)** a source of reservoir, **(3)** a channel or vector, and **(4)** susceptible people.

We in the pest control field can't do a great deal about the first or last of these requirements, but control of the source and elimination of the channels or vectors of diseases are very definite and positive phases of our work.

The transmission of communicable disease goes through a definite cycle, as does the life of any insect or rodent. We in insect and rodent control are concerned primarily with breaking up this cycle. In some instances, as with rats and mice, we do this largely by killing the adult. In other instances, as with many insects, we do this by killing the larvae.

There have been many instances of fine, direct cooperation between health departments and PCOs. To site one typical example, it wasn't too long ago PCOs in Kansas City, cooperating with their health department, carried on a magnificent job of rodent control during a disastrous flood which caused rats to run rampant over their city.

In all environmental disease control problems, public health officials and many other governmental officials have been our constant allies. The research work done by government scientists has aided and implemented that done by industry, and is a splendid example of cooperation between our two fields. The pest control industry and public health departments can be proud of the many contributions they have made to each other's advancement. The activities of both can harmonize and supplement the other through understanding and cooperation that comes by each getting to know the other's problems and objectives.

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Cost of 12—2-oz. Cans ..... $7.50 per doz.
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Bulk ..... $4.50 per lb.

Delivery Charges Prepaid
For complete information write or phone today.

MAR-MEL PRODUCTS, INC.

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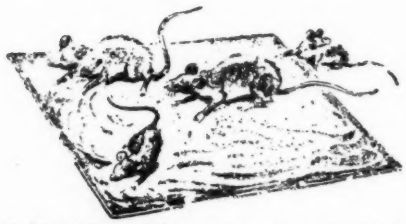
WONDER RAT BOARDS



a new type trap to solve difficult rat problems

A felt base with a specially prepared adhesive that is non-drying or hardening. Catches rats like flies on fly paper! Remains active indefinitely. Safe to use. No poisons required. Ideal for use in Food Plants, Warehouses, Etc.

$9.00 a dozen

SPECIAL PRICES TO THE TRADE:

6 dozen (72) ..... $7.50 per dozen
12 dozen (144) ..... 6.00 per dozen

WONDER RAT GLUE

Sold in bulk so you can make your own rat boards 6" x 6" for mice - 9" x 11" for rats are usual sizes

25 lbs. ..... $.80 per lb.
50 lbs. ..... .78 per lb.
100 lbs. ..... .75 per lb.

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Extra Business-- STEADY PROFITS! with SANI-AIR

Operators who install SANI-AIR Electric Deodorizers on a rental basis are assured of satisfied customers and steady repeat profits.

SANI-AIR is electrically controlled for maximum efficiency and dependability, generates that clean fresh aroma your customers associate with cleanliness. Sturdily built—U. L. Approved.

And you cash in on the steady profits from the monthly sale and servicing of liquid or disc refills. These refills — the finest on the market — are available in many highly pleasing scents.

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Many territories still available.

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The **ORB BOMB** contains a high potency non-toxic formula made especially for commercial and industrial use. Only 2 seconds is needed to treat 1,000 cu. ft. of space for flies. Controlled spray rate prevents waste. Fine particle size eliminates spotting. For use in control of housflies and fruit flies. May also be used in place of space sprays in large areas of several hundred thousand Cu. Ft. or more when fitted with convenient "Complete discharge valve."

In ¾, 1¼ and 3 lb. sizes.

ALSO. . . **ORB** Air Refresher & Deodorant aerosol bomb, in an odorless formulation or several pleasing fragrances.

ALSO. . . **ORB** Linspray. A completely odorless residual for all-around use. Especially useful in carpet beetle control.

Jobber inquiries invited

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Write for prices, details

Wallingford Rd. Media, Penna.

What's NEWS In The Industry

Fire Ant Can Cause Death; Serious Problem In South

"On a summer day, I suppose 1,000 persons in metropolitan New Orleans may be stung by fire ants," Rodney C. Jung, M.D. from the Department of Tropical Medicine and Public Health of Tulane University told **Pest Control** recently. "There is no doubt that many more are stung than are stung by bees," he said.

The U. S. Department of Agriculture recognizes the ant as an economic pest, hurting crops, game and birds. Now Tulane University scientists have recognized it as a medical pest, irritating many people and sometimes causing death.

After this ant attacks his victim, the bitten and stung area starts to itch and burn. It flares up and welts form in about one hour. During the day a swollen pus pocket appears, like a pimple.

Some people are allergic to the poison. Their eyes and lips begin to burn. The whole body itches. They feel their chest and throat begin to suffocate, as if they are suffering from a heart attack. Their windpipe swells, clogging the passage. Death could result, Dr. Jung explains. It is important doctors recognize the source of the trouble. Until doctors understand the problem, they may give wrong, useless treatment, he said.

Dr. Jung and Dr. Vincent J. Derbes, an allergist, do not believe the imported fire ant makes for an unusual medical problem, but consider it serious enough to find better ways to treat its bites. Epinephrine should be given to stop an anaphylactic reaction and Antihistaminics may be useful in some types of allergic reaction, Dr. Jung advises. Antibiotics are useless.

A native of Argentina, the imported fire ant (**solenopsis saevissima** var **richteri** Forel) is believed to have entered the U.S. through Mobile, Ala. in 1920. In 25 years it has spread through southeastern United States. Reddish in color, the fire ant is from 1/8" to 1/4" long, and prefers meat, bread, and other foods containing grease or proteins when it invades houses. In urban areas they damage lawns; invasion of homes is relatively minor.

A bill aimed at eradication of the imported fire ant has been introduced by Congress this year by Rep. Abernethy (D., Miss.). The bill would tighten the USDA's authority to control importations and interstate movement of all plant pests.

4-State PCO Meeting In Kansas

PCOs in Kansas, Nebraska, Missouri and Iowa are invited to a Four-State Pest Control Conference to be held at the Town House Hotel in Kansas City, Kansas, March 25-26. Program and registration details can be secured from Dr. Harlan Shuyler, 3138 State Ave., Kansas City 8, Kans.

"Research" Ill. Clinic Topic

Research on insecticides, with special emphasis on the effectiveness of Tabutrex, new insect repellent, is to share one-half of the two-day program announced for the 4th Annual Illinois Pest Control Clinic at the Allerton House in Monticello, March 25, 26.

Other half of the meeting sponsored by the Illinois Natural History Survey and the University of Illinois Bureau of Business Management, will be devoted to business problems. Delegates will survey opportunities in sanitation counselling, and hear advice on the recruitment, selection, and training of new personnel.

For additional information write Clinic Supervisor, 116 C Illini Hall, Champaign, Ill.

First picture of new NPCA home in Elizabeth, New Jersey.

NPCA Now In New Elizabeth, N.J. Home

New address for the National Pest Control Association is 250 West Jersey, Elizabeth, New Jersey. The association moved into its own building at this address late last month, according to Dr. Ralph E. Heal, executive secretary.

This three-story, Tudor brick mansion, that is the NPCA's permanent home, was formerly owned and occupied by Benjamin Moore, founder of Benjamin Moore Paint Co.

Dedication of the Elizabeth building is planned for May 9th, anniversary of the birthday of the association's first president and secretary, William O. Buettner. A dedication committee is planning a special program to mark the occasion. John K. Medoff, Hudson Exterminating Co., West New York, N.J., is chairman, and serving with him are Edwin J. Sameth, Western Exterminating Co., Newark; David P. McAlindin, Royal Exterminators, Newark; F. Kenneth Harder, Harder Extermniation Service, Hempstead, N.Y.; and Sidney Wimmer, Majestic Exterminating Co., New York City.

Full details on the dedicatory services will be announced later, assistant NPCA executive secretary, Robert Showalter advises.

Charles A. Alford, head of Arkansas State Plant Board's Pest Control Division, was formerly a school teacher and principal. He began working for the Board in 1938 and now supervises licensing of PCOs and inspection of termite and pest control work in Arkansas.

Mich. U. Resistance Course

Insect resistance, what is known and what can be done about it, is to be featured at the Second Inservice Training Course for PCOs being given by the University of Michigan's School of Public Health, Ann Arbor, March 11 and 12.

Sponsored at the request of the Wolverine Pest Control Association, the seminar is to have the following speakers on its program: Dr. Henry F. Vaughn, Dr. Richard J. Porter, Dr. Nathan Sinai, all of the University of Michigan; Dr. L. E. Chadwick and Dr. George C. Decker, from the University of Illinois; Kenneth D. Quarterman, chief of the Communicable Disease Center's Technical Development Laboratories; NPCA executive secretary, Dr. Ralph E. Heal; Dr. John V. Osmun from Purdue University; Dr. C. H. Hoffman, assistant chief of the USDA's entomology research; and PCOs Herman Fellton, Getz Exterminators, and Myron Sempliner, Eradico Co.

Enrollment fee is $10.00. Further information can be obtained from Dr. Henry F. Vaughn, Dean, School of Public Health, University of Michigan, Ann Arbor.

Brown Dayton PCO Pres.

At its most recent meeting, the Association of Master Pest Control Operators of Dayton, Ohio, elected Cleon O. Brown, Brown Pest Control, president, and I. M. Root, Root Termite Service, secretary-treasurer. The secretary's address is 237 Aullwood Rd., Dayton.

N.J. Short Course Draws 38

"Physiology and Toxicology of Insects" was theme of the New Jersey Pest Control Association's 14th Annual PCO Short Course, held at Rutgers University, New Brunswick, on Jan. 14-16.

Some 38 association members and guests attended the three-day meeting which covered material from the basic physiology of a simple cell to the complex physiology of a living insect and the reasons for changes of insect behavior and resistance to chemicals. Types of chemicals used today, their mode of action on insects, testing of insecticides, and the mechanics of resistance were also stressed.

Meeting instructors were Rutgers entomologists, Dr. John Schmidt, Dr. Andrew Forgash, Dr. Robert Treece, William Dauterman and John Libby.

During the meeting PCOs honored Dr. Bailey Pepper, head of Rutgers' entomology department, for his 25 years of service as a member of the entomology department.

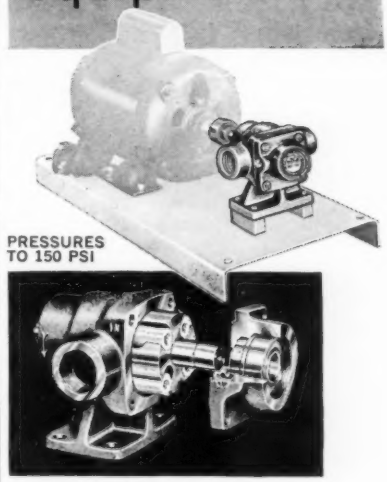
Becker Heads W. Pa. PCA

John Becker, Tri-State Sanitation Co., Pittsburgh, was elected president of the Pest Control Association of Western Pennsylvania at the group's recent monthly meeting in Pittsburgh. Other new officers are: vice president, David Buslik, Hersh Exterminating Co., Sharon; secretary, Harry Katz (elected for a 4th term), Elco Manufacturing Co., Pittsburgh; treasurer, Milton Zlotnick, Pittsburgh Exterminating Co., Pittsburgh; and directors, Frank Sheets, Rose Exterminator Co., Pittsburgh; Ed Witt, Witt Co., Pittsburgh; and Gilbert Rickel, Rickel Sanitation Co., Uniontown.

Corcoran New Conn. Prexy

At the annual meeting of the Connecticut Pest Control Association in Hartford recently, Daniel Corcoran, Jr., Abbot Exterminating Co. Bloomfield, was elected 1957 president. Tapped to serve with Corcoran during the coming year are: vice president, Fred A. Klett, Capitol Pest Control Service Co., Hartford; and secretary-treasurer, Joshua C. Reynolds, A-One System Exterminators, New Britain, Conn.

NOW . . . a pump that improves your termite control equipment

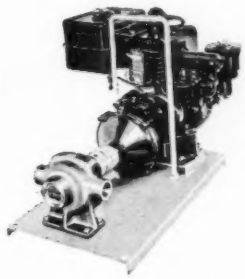


PRESSURES TO 150 PSI

FOR ELECTRIC UNITS

The Hypro Model N4000 ball-bearing pump with nylon roller impeller and Ni-Resist housing, is built for heavy industrial service, easily handles strong termite chemicals and fumigants. Delivers up to 5¾ gpm at 100 psi and 1750 rpm with ¾ hp motor.

FOR GAS-ENGINE DRIVE



PRESSURES To 200 PSI

The larger Series 6000 pump can be mounted directly on the "gear reduction" shaft of a gas engine for use in a pick-up truck or Jeep. Use it for weed spraying, mosquito control, transfer pumping, etc.

Write for detailed application data.

HYPRO PUMPS

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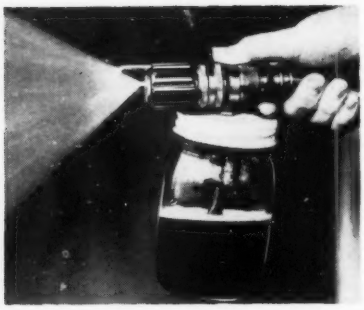

New "Mist-er-Mix" unit reportedly makes it easy to apply any type emulsion or concentrated liquid in either mist or jet stream. According to the manufacturer, solution is put into an ordinary mason jar and the unit attached to a garden hose. Mixing action is reportedly controlled by thumb hole at top. For full details on this device contact Bete Fog Nozzles, Inc., Greenfield, Mass.

New Starling Tree Spray

A new repellent spray that reportedly keeps starlings, sparrows and other nuisance birds from roosting in trees and on buildings has been developed by Aegis Laboratories.

Called Grosley's "No Roost" Starling Tree Spray, it is said to give six to eight months' protection when sprayed on the area to be protected. It is also said to be destructive to most types of tree insects.

According to the manufacturer, it will keep starlings, sparrows and other birds from roosting in any tree to which it is applied, and will repel squirrels. It will kill canker worms, gypsy and tussock caterpillars, climbing cutworms, grape bud beetles, ants, etc., the company says.

The new product is reported to be a water repellent chemical that will not melt in extreme heat nor freeze in extreme cold. It will not affect trees or leaves, nor harm birds, animals or people, Aegis reports. Claims are also made for keeping clover mites from entering buildings when the material is sprayed beneath window sills.

For further details on the starling tree spray, contact Aegis Laboratories, 7900 Stony Island Ave., Chicago 17, Ill.

Oklahoma PCO Conference

(from page 48)

reliable test method is complicated, according to this expert, but one indication of the presence of injurious quantities is EDB's odor.

"Avoid its use. Take no chances," Dr. Howe advised. "If necessary to use EDB, treat it with the utmost respect."

• Poison Control

Representing the Poison Control Center in Oklahoma City, Dr. H. A. Shoemaker complimented PCOs for keeping the number of poison cases extremely low. He did remind them, however, "Most anything that will kill a bug is likely to be a deadly toxin to humans.

"It is your job to erradicate pests without danger to people and animals that might be subjected to your treatments," the specialist explained, "and from reports we have received you have done a commendable job."

Because most of the poisons used by the industry are relatively new, symptoms of illness caused by them are not always known. Most physicians cannot recognize all the symptoms nor prescribe proper treatment. That's why poison control centers are being established across the country, according to this official from one of them.

• Fewer PCOs, More Work

"Appraently fewer people are doing more pest control work," Clyde Bower, state entomologist from Oklahoma said in a speech during the three-day conference.

The number of termite control licenses issued in Oklahoma decreased from 171 in 1954 to 118 in 1956, Bower pointed out, with the number of termite jobs reported last year rising to an all-time high of 4,242. General pest control licenses dropped from 99 in '54 to 89 in '56.

• New OPCA Officers

At a business meeting held during the college short course, members of the Oklahoma Pest Control Association elected officers for the coming year. They are: president, Bill Schorrenberg, of Dead Shot Chemical Co., Tulsa; vice-president, Bill Hand, Hand Exterminator Service, Oklahoma City; and secretary-treasurer, Tom Graham, Graham Pest Control, Oklahoma City.

Professor G. A. Bieberdorf, of Oklahoma A&M's entomology staff, was general chairman.

N.J. Mosquito Conference

Dr. Bailey B. Pepper, secretary of the New Jersey Mosquito Extermination Association, reports plans are being completed for the group's 44th annual meeting at Hotel Haddon Hall, Atlantic City, March 13-15.

Beginning Wednesday, the 13th, at 2 p.m., 30 speakers will present papers during four official sessions. For additional details, write Dr. Pepper, chairman, Entomology Department, Rutgers University, New Brunswick, N. J.

DDVP Registered by USDA

The organic phosphate, DDVP, is now permitted by the U. S. Department of Agriculture for use in fly baits. Usual approval of labels must be obtained. Previously, DDVP has been authorized only for experimental use.

DDVP is manufactured by the Montrose Chemical Co., 120 Lister Ave., Newark, N. J.

The Original . . .
And Still The Best!
GETZ
POWDER BLOWER

$1.00 EACH
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GETZ EXTERMINATORS, INC.
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KEEP WATER - RUST - LINT - DUST OUT OF YOUR FORMULATIONS
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Insecticides, Acids, Alkalis and Solvents

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Notebook

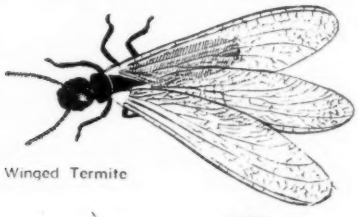
TIPS AND IDEAS FROM THE FIELD

"Swarming" Aphids

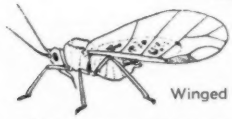
By Chester W. Robinette
Manager, Getz Exterminators, Inc.
St. Louis, Missouri

This past September we did a partial termite job for a downtown St. Louis retail store. We are always reluctant to do partial termite jobs on large buildings, and only did so in this instance at the building owner's insistence. So when the store manager called us a few days later to complain of "swarming termites, smaller in size than I have ever seen", it was disturbing but not too surprising.

Sometimes we have a fall swarming here in St. Louis of



Winged Termite



Winged Aphid

smaller than average termites. This, coupled with the fact we had only given the building a partial treatment, seemed pretty good evidence termites had made an appearance.

I went right over to the customer's store to investigate. His show windows were covered with black, flying insects. But they weren't termites, they were aphids!

As you know, aphids, are fairly small insects with four membranous wings nearly equal in size, having many fine cross veins. To the uninitiated, they could look like small flying termites. (Compare drawings of aphid and termite above) Since aphids are plant feeders and very seldom invade structures, we can't account for this sudden "swarming".

A space application of lindane in oil soon took care of the simplest "flying termite" job we have ever done.

CSMA Proceedings Available

Complete texts of several score technical papers in the insecticide, aerosol, automotive specialties, detergents and sanitary chemicals, disinfectant-sanitizer, and waxes-floor finishes fields are included in the latest Proceedings of the Chemical Specialties Manufacturers Association, now off the press.

Covering all papers presented at the association's 42nd mid-year meeting in Chicago last May, the 186-page printed report a'so includes formal reports of all CSMA technical and administrative committees. Copies of the Proceedings are available for $7.50 each from Association headquarters at 50 East 41st St., New York, N. Y.

Sodium Fluoride Letter

(from page 6)

tive calcium fluoride. Also, lime is very dusty and irritating. In the presence of moisture it promptly cakes.

Pyrophyllite lacks the objectionable features of lime and is eminently practical as a diluent. In fact, at 25-35% it substantially improves the action of the fluoride.

This paper, together with two others covering pyrethrum and rotenone published a little earlier, established the mechanism by which these toxicants enter the vital parts of the insect body and have been much quoted. Unfortunately, partial quotations taken out of context can lead to wrong conclusions.

George L. Hockenyos

Sentinel Laboratory
Springfield, Illinois

New Edition Labels Manual

The fourth revision of the "Warning Labels", Manual L-1, a guide for the preparation of warning labels for hazardous chemicals, has been published by the Manufacturing Chemists' Assn., Inc.

This manual includes a detailed definition of terms, a section on the preparation of warning labels, and illustrated sections on warning labels for 186 industrial and 92 pesticidal chemicals. The fourth revision includes new labels for 35 chemicals and revised labels for 44 chemicals.

Copies of the 115-page "Warning Labels," Manual L-1, are available at $1 each from the Manufacturing Chemists' Assn., Inc., 1625 Eye St., N.W., Washington 6, D.C.

Calendar

Pest Control Operators of California Annual Convention, Wilton Hotel, Long Beach, Mar. 7-9.

Professional Exterminators Assn. Meeting, Museum of Natural History, New York City, 8 p.m., Mar. 11.

University of Michigan Second In-service Training Course for Pest Control Operators, School of Public Health, Ann Arbor, Mar. 11-12.

Southwestern Branch, Entomological Society of America Meeting, Gunter Hotel, San Antonio, Texas, Mar. 11-12.

Oklahoma Pest Control Assn. Meeting, Rm. 122, State Capitol Bldg., Oklahoma City, 7:30 p.m., Mar. 12.

New Jersey Mosquito Extermination Association 44th Annual Meeting, Hotel Haddon Hall, Atlantic City, 2 p.m., Mar. 13-15.

Western Penna. Pest Control Assn. Meeting, Gateway Center, Pittsburgh, 8:30 p.m., Mar. 14.

Virginia State and Washington, D.C. Pest Control Assns. Annual Joint Meeting, Hotel 2400, Washington, D.C., Mar. 15-16.

Utah Pest Control Assn. Meeting, Biology Bldg., University of Utah, Salt Lake City, 9:30 a.m., Mar. 16.

Washington, D.C. Pest Control Assn. Meeting, 4904 Wisconsin Ave., N.W., 8 p.m., Mar. 18.

New Jersey Pest Control Assn. Meeting, Rutgers University, Entomology Bldg., New Brunswick, 8 p.m., Mar. 20.

Communicable Disease Center Course in Insect Control, CDC Field Training Stations in Atlanta, Ga.; Pittsburgh, Pa.; Mt. Vernon, N. Y.; Amherst, Mass.; Indianapolis, Ind.; Oklahoma City, Okla.; Denver, Colo.; and Seattle, Wash.; Mar. 18-29.

Maryland Pest Control Assn. Monthly Meeting, Pimlico Hotel, Baltimore, 12:30 noon, Mar. 21.

Michigan Pest Control Operators Conference, Kellog Center, Michigan State University, East Lansing, 9 a.m., Mar. 21-22.

Texas Pest Control Assn. Meeting, Texas Hotel, Fort Worth, 9 a.m., Mar. 23.

Kansas, Nebraska, Missouri and Iowa Four-State Pest Control Meeting, Town House Hotel, Kansas City, Kans., Mar. 25-26.

4th Annual Illinois Pest Control Clinic, Univ. of Illinois, Allerton House, Monticello, 8:30 a.m., Mar. 25-26.

Hawaiian Pest Control Assn. Meeting, Honolulu, 7:00 P.M., Mar. 26.

12th Annual Meeting, North Central Branch, Entomological Society of America, Hotel Savery, Des Moines, Iowa, Mar. 27-29.

National Sanitary Supply Assn. Annual Meeting and Trade Show, Conrad Hilton Hotel, Chicago, Ill., Mar. 31-Apr. 3.

Eastern Penna. Pest Control Assn. Meeting, Sylvania Hotel, Philadelphia, 6:30 p.m., Apr. 11.

15th Annual Canadian Pest Control Operators Conference, Queen's University, Kingston, Ontario, Apr. 11-13.

Super Highways To New Business

40,000 miles of paving, much over new routes, will be done at a cost of $27 billion over the next 10 years, in addition to present road programs. Every state will benefit from this federal grant. A road-building project of this magnitude will result also in the building of more resorts, hotels, motels, restaurants, and shopping centers. It will mean a projected half-million additional jobs and every business will be affected indirectly. Every new public-service facility will need preventive pest control. See how you can capitalize on this new nation-wide project.

Pyrethrins Synergist Source

During the December Chemical Specialties Manufacturers Association meeting in Washington, USDA researcher John Fales reported the development of a new synergist for pyrethrins, 3,4-methylenedioxyphenyl acetal, said to cause higher knockdown and mortality of house flies, mosquitoes, cockroaches, and Japanese beetles than the best commercially available pyrethrum synergists. (PC, Jan. '57, pg. 43.)

Shulton, Inc. of Clifton, New Jersey, has just announced it is offering test quantities of the new synergist, which it calls Sesoxane, from a pilot plant production. According to Shulton, Sesoxane is now in a price range where it can readily compete with other pyrethrins, allethrin and cyclethrin synergists.

New Wilson Glove Catalog

Wilson Rubber Co., of Canton, Ohio, has come out with a new 16-page catalog describing its line of Wil-Gard Industrial Gloves and Finger Cots.

The catalog covers the firm's complete stock of rubber, latex, neoprene, Buna-N and Compar plastic gloves. Included is a chart of finger cot sizes and a two-page recommended use table showing the resistance ratings of various Wil-Gard glove materials to 199 chemicals and solvents commonly used.

Additional information can be obtained by writing the firm at 1200 Garfield Ave., S. W. Canton 6, Ohio.

VA Won't Take Free Inspections

(from page 32)

of insect damage, PCOs and public health, and common household insects.

Speakers included N.C. State College entomologist, G. D. Jones, Roy M. Carter, W. M. Kulash, R. T. Gast, and F. E. Guthrie; entomologists from Virginia Polytechnic Institute James Greyson, head, and J. O. Rowell; USDA Forest Service experts from their Asheville, N.C. station Joe Kowal and A. F. Verrall; members of the N.C. Structural Pest Control Commission, D. L. Wray and Charles White of the N.C. Board of Health; R. A. Monerief from the Georgia Structural Pest Control Commission; A. L. Pickens, professor at Queens College in Charlotte, N.C.; Jessie M. Page, Raleigh, N.C. architect; NPCA executive secretary, Dr. Ralph E. Heal; Purdue entomology chief, Dr. John V. Osmun; and PCO Al Bender from Washington, D. C.

● Latest NCPCA Officers

Officers of the N. C. Pest Control Association for 1957 were elected during a business meeting following the three-day short course. They are: president, Roy Goforth, Arrow Exterminators, Inc., Fayettsville; vice-president, Ivey Coward, Ivey Coward Co., Greenville; and secretary-treasurer, Delia Copely, Best Exterminating Service, Inc., Durham.

The association has also appointed a committee to write up specifications for control of termites. Walter Wilson, Wilson Exterminating Co., Winston-Salem, is chairman. Working with him are Adrian Gaynor, National Pest Control Co.; D. L. Goforth, Arrow Exterminators, Inc.; and Max Kuykendal, Orkin Exterminating Co., all of Greensboro.

Dry-wood's Moisture Preference

(from page 51)

seal-in moisture when it is needed in situations where the external environment is dry. In such instances dry-woods quickly huddle, tightly-packed, together for a day or two (as shown in Fig. 2, page 51) until such time as they can build up sufficient carton to seal-in and retain moisture. Only then will they separate and act as a normal colony as pictured in Figure 3 on page 51.

Contains pertinent portions of the Department of Agriculture's **Cooperative Economic Insect Report,** material from university entomology departments, and reports from readers. PCOs noticing infestations in their own areas are urged to communicate with **Pest Control** so their information may be added to this infestation report.

BROWN-BANDED ROACH
(Supella supellectilium)

Arizona: Widely distributed in Yuma County. **Virginia:** Heavy in home in Rockbridge County. **Utah:** Infesting several homes at Logan and one in Salt Lake City.

BROWN DOG TICK
(Rhipicephalus sanguineus)

Arizona: Heavy infestation reported in and around home in Tucson within the last month. **Oklahoma:** Heavy at home site in Oklahoma City.

CADELLE
(Tenebroides mauritanicus)

Texas: Infesting wooden bin of wheat in Clay County.

CLOVER MITE
(Bryopia praetiosa)

Virginia: Extremely heavy in and outside industrial plant at Waynesboro.

CLUSTER FLY
(Pollenia rudis)

Virginia: Large numbers in some Blacksburg and Craig County homes.

HEAD LOUSE
(Pediculus humanus capitis)

Virginia: Infestation reported by a Lynchburg doctor recently.

KHAPRA BEETLE
(Trogoderma granarium)

California: A new property found infested in Riverside County making a total of 17 for that county and a new infestation in Holtville is the 21st for that city and the 156th for Imperial County. A total of 280 infestations in 18 counties have been found with a volume of 71,388,331 cubic feet of storage. Of this number 262 involving 67,021,964 cubic feet, have been treated. **Oklahoma:** Statewide survey begun. No infestations to date. **Oregon:** A survey of seven grain storage sites in Grant County recently showed no infestations.

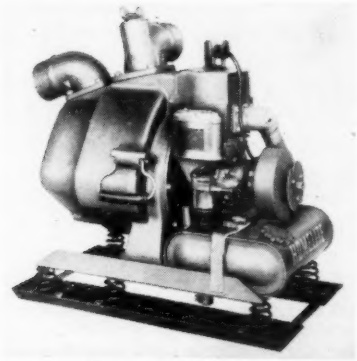
STORED GRAIN INSECTS

Oklahoma: Light infestations of the following noted in three feed and seed establishments in Pottawatomie and Oklahoma Counties: Lesser grain borer, saw-toothed grain beetle, Indian-meal moth and dermestids.

Uncut Wheat Insect Free

Rumors about infestations of grain-infesting insects in wheat before it is harvested frequently are heard from managers of country elevators throughout the Midwest, Kansas State College entomologists report.

However, a survey of ripened, uncut wheat in 34 Kansas counties the past summer by Kansas State scientists did not reveal a single grain-infesting insect.



New Homelite centrifugal pressure pump is said to have a capacity range of from 55 gallons of water per minute at 70 pounds pressure to 205 gallons of water at open discharge. Weighing 107 pounds, the new unit is reportedly self-priming and comes equipped with 3" suction and discharge fittings. Write Homelite, Port Chester, N. Y., for any additional information on this unit.

Suppliers' Staff Changes

Frank Seeland has been elected a vice president of S. B. Penick & Co., of New York, N. Y. Mr. Seeland is head of the firm's agricultural chemical and insecticide division.

David H. Sparks has been appointed southeastern technical field representative for Geigy Agricultural Chemicals. He will make his headquarters at Leland, Miss.

Alfred G. Raufer has resigned as director of sales for the Michigan Chemical Corporation, of St. Louis, Mich.

New manager of commercial products for the Diamond Black Leaf Co., Cleveland, Ohio, is **Emil C. Gerdes.** He succeeds **Dr. James M. Merritt,** who has resigned. In another company personnel shift, **Bernard Clayton** takes over as district manager of the western district sales office in San Jose, Calif.

Sterling Drug Buys d-Con

Sterling Drug, Inc., has purchased the d-Con Company, of Chicago. The d-Con line of rodent chemicals will be manufactured at a plant under construction in Alliance, Ohio.

Frank A. Corbet, a divisional vice president of Sterling's national brands division, has been elected president of the d-Con Co. Jerome S. Garland, former president of d-Con, will assist him in a consulting capacity.

Hollingsworth Orkin Ala. Mgr.

A. B. Hollingsworth has been appointed Alabama district manager for Orkin Exterminating Co.

DDT for House Mice

Suggestion from the North Central States Office of the rodent control branch of the U. S. Fish & Wildlife Service, is that DDT powder lightly dusted on the floor, in out-of-the-way places will usually destroy mice in a few days.

The division's latest "Rodent Control News" says, "It is normally easy to trap house mice and, if a number of traps are set, an infestation can be removed. However, most people fail to set enough traps and infestations may persist. Or in some cases, a few individual mice seem to snub their noses at tempting poisons or trap baits."

DDT powder is one remedy for such cases, the F&WLS says. "Mice walk through the dust and, in the process of feeding upon the food they pick up, they lick their paws or preen their fur and thus consume enough DDT to cause death. DDT is highly toxic to them whereas rats are quite tolerant to the effects of this poison used in the same manner," according to their statement.

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TODD INSECTICIDAL FOG APPLICATOR

Successfully Used for over 12 Years in Community Fly and Mosquito Programs

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Tifa was the first in the field of fog applicators. Tests have proved it best in the field for space control around the community . . . on the dump, over pools, in suburbs, everywhere insects swarm!

This amazing machine discharges newly-developed insecticides as well as the older types in a true, clean fog which spreads quickly and permeates the deepest crevices. This ability means a better insect control program for your community. Put Tifa to work for you.

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MOTHPROOFER

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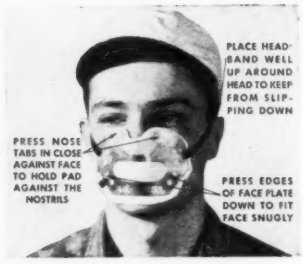
MARTINDALE

PROTECTIVE MASKS


PLACE HEADBAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

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No. 1 Refills (standard wt.) .02 ea.
No. 2 Refills (heavy wt.) .02½ ea.
Masks packed in individual envelopes. Refills packed 25 to a box.
No. 2 Refills (heavy wt.) contain twice as much filtering cotton as No. 1

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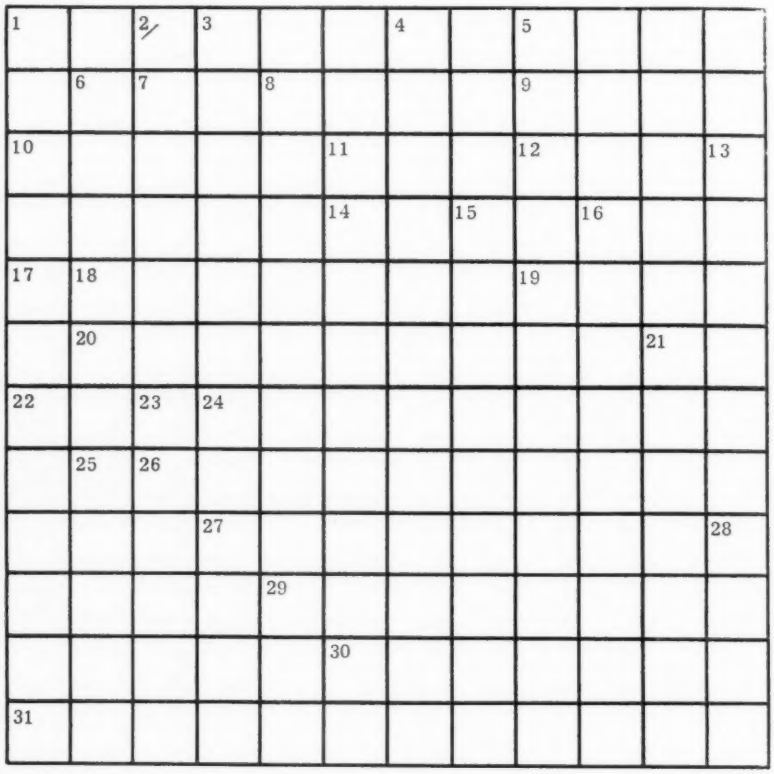
—Primer—

PEST-O-GRAM 2

By D. CARL LELLA

Here's No. 2 in the series of six crossword quizzes that began in January. No. 3 will be published in June. Author Lella, foreman of exterminators of the New York City Housing Authority - and crossword puzzle fan from 'way back, worked these up to test your knowledge of common terms and abbreviations used in pest control work. Under each heading, "Across" and "Down," is a list of explanatory phrases preceded by a number which designates the square in which the needed word begins. At the right of each phrase is another figure (in parenthesis) which reveals the number of letters each definition requires. Start with the square numbered for each term and print in the word you think best fits the phrase, one letter per square. Hope you do better than you did in January!



	ACROSS	Letters Required Across
1.	Largest type roach	(8)
5.	Prepared rat food	(4)
7.	External opening for breathing	(7)
9.	Transmitters of Typhus	(4)
10.	Flying mammals	(4)
11.	Booklice	(7)
14.	Bedbugs choose this for habitant	(3)
15.	Any foul substance	(4)
18.	Enormous snake	(6)
19.	Domestic enemy of rodents	(3)
20.	Bee shelters	(5)
22.	Animal shelter	(3)
24.	First stage of metamorphosis	(3)
26.	To free of gas	(5)
27.	Lindane	(7)
29.	Fumigant chambers	(6)
30.	Fever contracted from Anopholes mosquito	(7)
31.	An expert on insects	(12)

	DOWN	Letters Required Down
1.	Rodent used in research lab	(6)
2.	Purpose of any opening	(5)
3.	Nozzle used on gardener sprinkler can	(4)
4.	Mineral rat poison	(7)
6.	Moth repellent nugget	(7)
8.	Substitute (abb.)	(3)
12.	17 year locust	(6)
13.	Black widow	(6)
15.	Pertaining to daytime	(7)
16.	Being affected with rabies	(5)
17.	Spray jets	(7)
21.	Having wings	(5)
23.	Stenches	(5)
25.	Rodents	(4)
27.	Pounds (abb.)	(3)
28.	Flesh bait	(4)
29.	--- and vigor	(3)

(Solution on Page 70)

Toxicity of Endrin

A report in the August 18, 1956, issue of the **British Medical Journal,** emphasizes the extreme care with which endrin must be used. The article was authored by G. M. Davies, medical officer of health, and Ieuan Lewis, senior sanitary inspector, both of the Pontardawe Rural District Council, and was entitled, "Outbreak of Food-Poisoning from Bread Made of Chemically Contaminated Flour." A summary of the article reads as follows:

"The investigation has established that a consignment of endrin dispatched on February 20, 1956, leaked 3 gallons (13.6 litres) into the conveying wagon in transit. The same wagon, which was used for the conveyance of empties between February 20 and April 25, was on the latter date loaded with sacks of flour at Cardiff and dispatched to Swansea. Of the 100 sacks carried in the wagon it was proved that two absorbed endrin from the vehicle floor, and both these sacks were delivered to one baker as part of the weekly consignment. One of these sacks was returned and endrin was found to be present in some parts of the flour to the extent of 5,500 parts per million. The other sack was used by the baker to manufacture loaves which caused 49 people to be ill enough to require medical treatment.

"Endrin was recovered from some parts of the bread consumed to the extent of 150 parts per million. It was further established that while in the bakery the empty contaminated sack, which had contained national flour, came into contact with dough made from patent white flour which, having been used to make white bread rolls, caused 10 men to become ill at a local works after consuming them.

"Samples taken from the wagon floor and analysed on June 8 showed endrin still to be present in one section of the wagon to the extent of 116,000 parts per million."

Elect McMahon Bros. Prexy

Paul J. McMahon was named president of McMahon Brothers, Inc., Binghamton, N. Y. weed and brush control firm, by the company's board of directors in December. He joined the firm, which services accounts throughout the Northeast, shortly after World War II as sales development chief.

Mr. McMahon currently serves as chairman of the National Pest Control Association's advertising committee.

NSSA Show Begins March 31

The National Sanitary Supply Association will hold its 34th annual Trade Show and Convention in the Conrad Hilton Hotel, Chicago, Ill., March 31 through April 3rd, according to Leo J. Kelly, executive vice-president.

Upholds Warfarin Patent

According to the Wisconsin Alumni Research Foundation, its patent for warfarin, anticoagulant rodenticide, has been favorably interpreted in Japan where the Toko Chemical Co., Ltd. is reported to have sought a declaration that its process of making the rodenticide was outside the foundation's patent. WARF's patent covers the synthesis of warfarin by the condensation of 4-hydroxycoumarin with benzalacetone. The Tokyo firm's process is said to involve a reaction between anilinobenzalacetone and 4-hydroxycoumarin.

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Now being produced at our modern plant in Newark, N.J., Kolker Methyl Bromide is the outstanding fumigant for the elimination of insect and rodent infestation of grain, tobacco plant beds, seeds, dried fruits, cereals, nursery stock and a wide variety of other products.

KOLKER METHYL BROMIDE

- Kills insects, mites and related pests in all stages of their development.
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- Has rapid volatilization and a high rate of diffusion into stored grain, bales, packages and soil.
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- Does not leave any residual odors, tastes or stains.
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Kolker Methyl Bromide is packaged in regular one-pound cans with 2% chloropicrin as warning agent, and 125, 150 and 450 pound cylinders of 100% methyl bromide.

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Spear Recommends Physicals

(from page 46)

technical director of Orkin Exterminating Co., to describe the three-step strategy he recommends for ant and silverfish control.

In the "attack," the PCO must trace the pest to its nest and apply the insecticide directly on it.

For the "fortification," the operator must build barriers of insecticide around a house, and at the same time check trees and clothes lines that touch the house for possible avenues of entry.

To "defend," control measures must be applied inside the house for ants and silverfish which dwell within.

• Ask for Construction Photos

J. C. Redd, of Redd Pest Control, Jackson, Miss., and Ted Tomeny, Orkin Exterminating Co., Baton Rouge, both agreed in their discussions of termite control problems in new construction, that many of today's new homes are "architectural nightmares."

"Get the plans of the house from the owner or contractor before you treat," Tomeny advised. If these aren't available, check with owners for snap-shots they may have taken during its construction. Any knowledge of how the house was built will help the operator trying to service it for termites.

Modern construction makes it difficult and complicated to predict what course of operation termites are following, Redd pointed out. He also warned operators of the difficulty of refinishing a room when work has been completed because of the wide variety of paints and materials used in them.

Other speakers at the three-day conference included Myron W. Smith, NPCA president, who spoke on ethics; LSU's Dr. J. Harvey Roberts who conducted a laboratory session on the identification of pests; Mrs. Ruby Abel, Texas PCO, who told of her trip to the European International Pest Control Congress; LSU's Dr. H. Bruce Boudreaux speaking on resistance; Orkin Exterminating Co. vice-president, Ted Oser on selling methods; North Carolina State University entomologist, Dr. Clyde Smith, who talked on identification and control of domestic roaches; Walter W. Dykstra, assistant to the chief of the Fish & Wildlife Service's rodent control branch, who discussed what's new in rodenticides; and Mississippi State College's Dr. E. W. Stafford, who talked on the biology of termites.

• Dr. Rosewall Honored

Dr. O. W. Rosewall, professor of entomology at LSU and general chairman of the conference, received from Texas PCO Dr. C. A. Trimbos the honorary life membership in the Texas Pest Control Association which that group conferred upon him at its 12th annual convention. Presentation was made at the LSU conference banquet.

New Dieldrin Pamphlet

"How to Keep Your Home Insect-Free With Dieldrin" is the title of a new pamphlet isued by the Shell Chemical Corp. Colorfully illustrated, the eight page folder lists the most common species of home invading insects and gives control recommendations for each.

Free copies of this publication are available to PCOs from Shell's Agricultural Division at 460 Park Ave., New York 22.

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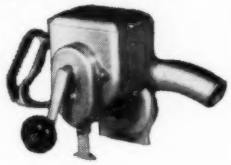
SMITH PESTMASTER DUSTER

World's lightest, smoothest and easiest working insecticide duster. Weighs 1¼ lbs. Non-rust, all metal construction. Throws 9 ft. dust stream. Nothing matches it. Very popular.



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Positive: Birds will not perch any place BIRD-RID has been applied. It is water repellent, will not wash away, will not freeze nor melt.

Economical: A little goes a long way. A pound will cover approximately 15 to 20 lineal feet, 2 inches wide.

Legal: Will absolutely not kill or injure the birds, but will repel them from perching, if used as directed.

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Box 5026 Memphis 12, Tenn.

Decker Warns PCOs at Purdue

(from page 42)

emulsions over oil solutions, he said, because water eliminates the possibility of oil-caused damage, such as the inability of plastic materials commonly used for membrane waterproofing to withstand constant exposure to oils.

Chemicals listed by Mr. Smith for termite control included: sodium arsenite, chlordane, dieldrin, pentachlorophenol, trichlorobenzene, ethylene dibromide, sodium pentachlorophenate, and DDT. Whichever you use, he warned, watch the rate at which soil is absorbing your toxicant; it may be going into a sewer line!

• FHA's MPRs

Since the Building Research Advisory Board provided the Federal Housing Adminsitration with its report on the protection of residential construction from decay and termites, the termite control industry has been waiting for the day when the recommendations of the BRAB report will become part of the FHA's Minimum Property Requirements. NPCA secretary Dr. Ralph Heal said all MPRs are being revised and should be coming "soon". No date was given.

Dr. Heal did announce his national association is going to prepare an Approved Reference Procedure for Pre-treating Soil to prevent termite attack, a "bible" similar to the NPCA's present ARPs for Subterranean Termite Control. The new work is to incorporate recommendations in the BRAB report, plus those made a part of the finally-published MPRs, and experience of termite operators across the land.

• Soil Fumigant Usage Beneath Slabs Discouraged

A soon-to-be-released statement by the NPCA will advise members neither ethylene dibromide nor methyl bromide should be used for soil fumigation beneath slabs, unless a TO has unusual chemical testing facilities.

This drastic stand by the association in face of the thousands of reportedly successful slab fumigation jobs performed on the West Coast, comes because all too little is known about the movement of fumigants in soil and their tendency to penetrate cracks or openings in concrete slabs to poison the living area above.

John H. Davidson from the Dow Chemical Company explained the research his company has done on the diffusion of fumigants through soil for root knot nematode control, but expalined this is all the information they have available on soil fumigation. Dow's tests on nematode control included only the injection of EDB in uncovered soil and they have no experience with the fumigant in "covered" soil. Another Dow representative, J. E. Peterson, reported on the health hazards associated with EDB and methyl bromide and suggested anyone interested in using these fumigants read two publications available from Dow in Midland, Michigan: "Precautions for Methyl Bromide Fumigations" published September 1, 1948, and "The Analysis of Air for Halogenated Hydrocarbon Contaminants," reprint of an article appearing in the December 1956 issue of American Industrial Hygience Association Quarterly.

• Dispersion Test Method

Purdue's entomology department prepared for the first time a demonstration method to test the dispersion in soils of fumigants and insecticides. Six, five-foot long, six-inch diameter polyethylene air-tight casings were filled, two with sand and the others with soil. Dyed water soluble and oil soluble formulations of termite toxicants were used and one was treated with ethylene dibromide fumigant. Dr. George E. Gould ran this preliminary experiment to see how far toxicants will travel in soil. Some indications of dispersion were noted, but no conclusions could be drawn because of unanticipated errors in the application of chemicals. The method may, however, serve as a basis for arriving at a laboratory procedure for testing the effectiveness of termite chemicals in soil.

• 1958 Date Set

Dr. John V. Osmun, head of Purdue's entomology department, announced to the better than 350 attending this year's annual banquet, the 22nd annual PCO conference to be held at his university would run from January 27th through the 31st, 1958.

It was also revealed at the banquet, Purdue's Research and Development Fund, to which PCOs have contributed during the past 21 years, has been re-named the J. J. Davis Research Fund to perpetuate and honor the distinguished entomologist who headed Purdue's entomology department until June of last year when he retired and became professor emeritus in entomology.

Delegates to this year's conference came from 28 states and Canada, 100 of the 361 attending for the first time.

Rabbits Pest in Kansas

Jackrabbits are a serious problem in several sections of Kansas because they have congregated in the few areas that have wheat pasture and feed grains, George Halazon, rodent control specialist at Kansas State College, Manhattan, reports.

If poisoning is necessary to reduce populations, Halazon recommends 1 ounce of strychnine alkloid dissolved in a gallon of hot water with a handful of salt, and sprinkled over 10 pounds of alfalfa leaves. Milo heads dipped into a strychnine paste are also effective against rabbits.

How to control jackrabbits and other animals that damage farm crops is told in Circular 328, "Controlling Damage Caused by Animals." It is available free from the Agricultural Experiment Station at Kansas State College, Manhattan.

Sanitation Show Oct. 14-16

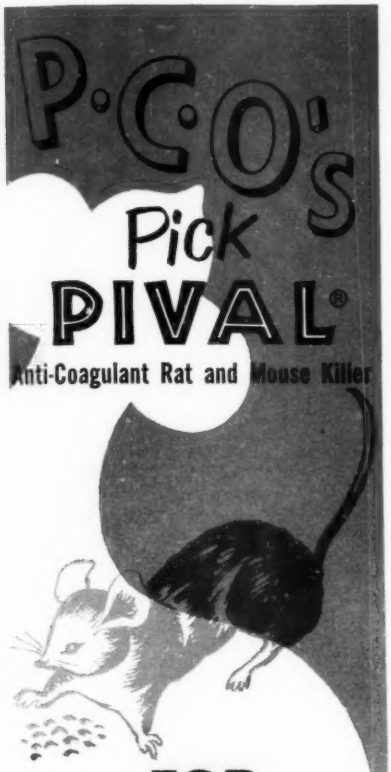
The second annual Sanitation Maintenance Show and Conference will be held at Navy Pier, Chicago, October 14-16. It is sponsored by the Industrial Sanitation Management Association, Association of Food Industry Sanitarians, and the National Association of Bakery Sanitarians.

Further information about this meeting can be obtained from Orkin Expositions Management, 19 W. 44th St., New York 36, N.Y.

New Velsicol Pesticide

Velsicol Chemical Corp. announces that it has begun production of the phosphate insecticide, methyl parathion. This is the first organic phosphate manufactured by Velsicol, which has hitherto concentrated on chlorinated hydrocarbon chemicals.

Further details are available from Velsicol at 330 E. Grand Ave., Chicago 11, Ill.



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PIVAL is tops in acceptability! Tests with other anti-coagulants show PIVAL has substantially greater acceptability, offering more effective control.

PIVAL resists insects! PIVAL baits are less subject to insect infestation even under severe conditions which means baits remain uncontaminated longer.

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Join the leading P.C.O.'s who pick PIVAL for dry baiting. Now time-tested, it's been proven tops for controlling Norway rats, roof rats and house mice. Order now.

MOTOMCO, INC.
Terminal Ave., Clark, N. J.

Publications for PCOs

Here is the latest list of government, university and association publications of interest to pest control operators. Some can be obtained free of charge while others are modestly priced. When ordering be sure to include title and catalog number (if any).

The following booklets are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. (Send check or money order; no stamps.):

Soil Survey Manual. 1951. 503 p. $3.00. Catalog No. : A 1.76:18. Soil survey reports are available by counties for many states. If you want to find out if there is one for your county contact the Supt. of Documents.

Ants in the Home and Garden. 1953. 8 p. 5c. Catalog No. : A 1.77:28.

Protecting Log Cabins, Rustic Work, and Unseasoned Wood from Injurious Insects in Eastern United States. 1956. 18 p. 15 c. Catalog No. A 1.9:2104.

Lawn Insects, How to Control Them. 1956. 24 p. 15 c. Catalog No. A 1.77:53.

These pamphlets can be obtained free from the Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.

Device for Screening Fumigants. 1956. 4 p. ARS-33-32.

Bioclimatic Cabinets Used in Studies on the Mexican Fruit Fly and the Pink Bollworm. 1956. 12 p. ARS-33-33.

A Sprayer for Applying Insecticides to Small Plots. 1956. 4 p. ARS-33-34.

For a free copy of the following publication contact Committee on Pesticides, American Medical Association, 535 North Dearborn St., Chicago 10, Ill.

The Effect of Known Repeated Oral Doses of Chlorophenothane (DDT) in Man. 1956. 8 p.

These bulletins can be procured free by writing the Bulletin Room, University of Minnesota, Institute of Agriculture, St. Paul, 1.

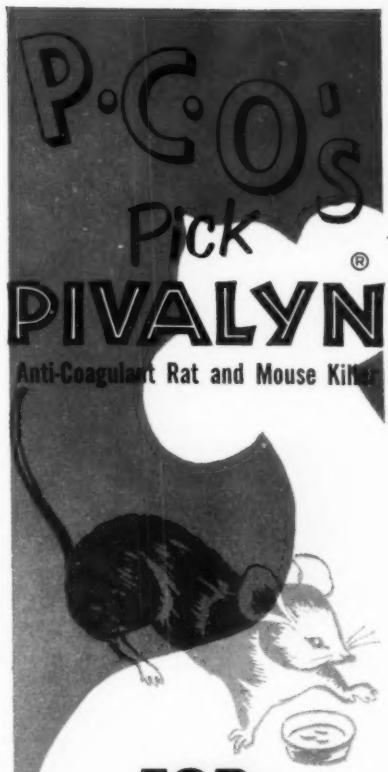
Quackgrass Control. 1956. 12 p. Bulletin 434.

Weed Control in Minnesota. 1956. Extension Folder 191.

Weed Control in Minnesota (A Summary). 1956. Extension Folder 191T.

New Olin Mathieson Hdqrs.

In order to provide improved service, operations of the North Central district of the Plant Food Division of Olin Mathieson Chemical Corp. have been consolidated in new headquarters at 800 South 72 St., Omaha, Neb., according to S. Y. Roth, district manager.



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Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Pest Control, 1900 Euclid Avenue, Cleveland 15, Ohio.

Rates: "Position Wanted" 5c per word, minimum, $1.00. All other classifications, 10c per word, minimum $2.00. All classified ads must be received by Publisher at least three weeks preceding publication date and be accompanied by cash or money order covering full payment.

HELP WANTED

OLD ESTABLISHED, growing and progressive pest control firm in Tennessee needs man with ambition and management ability, also, sales-service man. Experience in pest control helpful. Salary, commission and excellent opportunity for the future. All applications confidential. Write in detail to Box 435, Pest Control magazine.

OPPORTUNITY. Medium size manufacturer wood preservatives and termite control chemicals wants experienced sales manager to sell exclusive termite franchises in 25 states in which we have a nice volume of business. Trade mark, name and chemical. Company has no debts and amply financed although the man selected will be required to make some investment in the company to show good faith and become an officer. He also must expect to make some financial sacrifice in earnings the first year. The present owner would like to retire, and after his and his wife's death the business would become yours without further investment. This business has unlimited possibilities, for a hard worker and someone who is willing to wait a few years to reap the benefit. If you can qualify, give full and complete history and background, age, references and small snapshot first letter. Box 430 Pest Control magazine.

ENTOMOLOGISTS with structural pest control experience. We have immediate openings for aggressive young men with sales ability and minimum of 2 to 3 years of structural pest control experience to manage offices. Liberal salary, commissions and over-rides enabling hard workers to earn $8-$10,000 annually. Many other company benefits. Must be available immediately. Write giving experience and small non-returnable photograph. Interviews in Pittsburgh at our expense. Write L. L. Crosby, President, Commonwealth Sanitation Co., 3567 Bigelow Blvd., Pittsburgh 13, Pa.

OPPORTUNITIES UNLIMITED. The world's largest pest control organization (AAA-1 rated) has interesting openings for men with initiative and ambition. We operate in 28 states from coast to coast and there are opportunities open in many phases of our operation . . . servicemen, managers, technical representatives and salesmen. Experience in professions related to pest control helpful, though not necessary. Liberal salary and incentive arrangements provide unparallelled opportunities for men with good judgement and the ability to get along with people. Our firm, over 50 years old, offers employee benefits including paid vacations, sick leave, life insurance, hospitalization and pension plan. All replies confidential. Write in detail to Orkin Exterminating Company, Inc., 713 Peachtree Street, N. E. Atlanta, Georgia. Attention: Personnel Department.

WANT TO BUY

PEST control business in New England. Large or small. Will pay cash. All replies confidential. Write to Box 424 Pest Control magazine.

INTERESTED in purchasing exterminating business for cash in New York City (large or small). Will pay top price. Write Box 432 Pest Control magazine.

WILL BUY small pest control business in Pennsylvania, Ohio, Kentucky and W. Va. Write details to R. D. Erdie, Ace Exterminators, Inc., 410 Ogden Ave., Fairmont, W. Va.

FOR SALE

ONLY TERMITE control business in Tusc. county. Due to owner's ill health, must move to Arizona. Best reputation. References. Grossing $25,000 annually. Opportunity for husband-wife operation as office adjoins 3-bedroom, 4-year-old brick bungalow on state Route 8. Operating two trucks, have all equipment necessary for substantial profits now. For inspection of this property and details on business, write or call Dover, Ohio 3-4652. James L. Moore, 823 East Avenue, Dover, Ohio.

WILL SELL all, or interest, small exterminating business, South Florida. Now paying all expenses plus some profit but need cash now. Excellent prospects. Box 434, Pest Control magazine.

EXTERMINATING, fumigating and termite control business in Denver, Colo. Established since 1929. Fully equipped to handle any size job. Carries large number of termite contract yearly renewals and monthly service contracts. Includes Terminix franchise with E. L. Bruce Co. for entire state of Colorado. Box 429 Pest Control magazine.

EASTERN IOWA, western Illinois termite control company. Best in area. Well established. Ideal one man sales management operation. Annual volume over $30,000. High net profit. Large established renewal accounts. Will pay back investment in two years. Owner entering another field. Box 433 Pest Control magazine.

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Agricultural Specialties 21
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Need Fumigation Instructions?

If you're interested in fumigation, but lack the know-how to use this pest control method, a handsome instruction manual on the proper use of methyl bromide is available from Michigan Chemical Corporation, 500 North Bankson St., St. Louis, Mich. Ask for "Pestmaster Fumigation Manual."

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A	m	E	R	i	c	A	n	B	a	i	t
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ENTOMOLOGISTS WANTED

Structural Pest Control Experience

We have immediate openings for aggressive young men, with sales ability and minimum of 2 to 3 years of structural pest control experience, to manage offices. Liberal salary, commissions and over-rides enabling hard workers to earn $8,000-$10,000 annually. Many other company benefits. Must be available immediately. Write giving experience and small non-returnable photo. Interviews in Pittsburgh, at our expense.

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EXTENSIONS—Straight and curved extensions in choice of lengths from 8" to 48".

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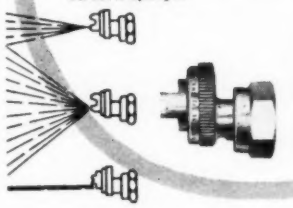

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Tip rotates for spray selection from fine solid stream...to wide angle, finely atomized cone spray.

For information write for Bulletins 76 & 72.

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BELLWOOD, ILLINOIS

Pestales

Close second. A special delivery, air-mail notice arrived in the office last month telling us of the election of Mrs. Elaine B. Johnson as chairlady of California's North Coastal PCO District, and claiming her to be the first woman in the U.S. to be elected to a pest control association office. Unfortunately, Mrs. Johnson is deprived of the honor, though, for Mrs. Carrie Payne previously was elected president of the Tennessee Pest Control Association for 1957. Nevertheless, Mrs. Johnson is to be congratulated for being selected to hold an important office. For the past 20 years she has owned and operated Johnson Ant Control in Walnut Creek, California.

* * * *

Mother Love: Upstate New York farmer, Karl Kurtz, doesn't like mice, especially in his barn. One morning not long ago he spotted three of the little invaders in his barn and gave chase armed with a shovel. To his surprise they headed straight for a straw-filled box which housed the family cat. When Farmer Kurtz looked into the box he found an angry, hissing feline. Just one thing, though. The cat wasn't mad at the mice, but rather at Farmer Kurtz. Seems she had lost two kittens a short time before and had adopted the mice. *There's just no telling what a female will do!*

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Southern Comfort. John Osmun, major domo at Purdue's entomology department, need no longer have any fear and trembling rebel southerners may challenge his presence in the Deep South when his travels take him down yonder. No suh! At the PCO conference held on his campus last month, Montgomery, Alabama PCO Jim Sims presented Yankee Osmun with a citation appointing the good doctor a Colonel in the Confederate Air Corps. Wonder how Col. Osmun is gonna cover up the New England accent he's been born wid?

* * * *

Plummer E. Diehl, president of a pest control company in Salem, Ohio, bearing his name, suffered a heart attack recently, but is reported to be on the road to recovery.

* * * *

Honorary Members. J. Harrie Burdge, octogenarian PCO from Raymond, Maine, and Arnold Mallis, Gulf Research entomologist who authored "Handbook of Pest Control", were both elected to honorary membership in the NPCA at its convention last year, but neither was present to receive the award. They did get their plaques this year, though, Mr. Burdge at the Eastern PCO conference, and Mr. Mallis during the Purdue meeting.

* * * *

Unexpected passing. Edward A. Hollatz, 52, office and service manager in Harlem Ives' Detroit Rose Exterminator Co. office, died suddenly on January 22nd. Ed, who had been with Harlem 13 years and is well known to PCOs in the Mid-West, leaves three children and his wife.

* * * *

Quarter century completed. Members of the New Jersey Pest Control Association earlier this year held a testimonial luncheon for Dr. Bailey B. Pepper, head of Rutgers entomology department, who has completed 25 years of service at the University. Dr. Pepper and his staff have always been available for help to PCOs and have regularly sponsored short courses for industry members in the eastern part of the U.S. Congratulations to this eminent entomologist and friend of the PCO.

* * * *

Newest specimen. The Harlan Shuylers, of Kansas City, Kansas, sent a clever birth announcement heralding the latest addition to their "collection". Their new baby, William Reynold, is a blond, blue-eyed boy that weighed-in at 8 lbs. 4 ozs.

* * * *

Hunting accident. Dr. E. H. Fisher, well-known extension entomologist at the University of Wisconsin in Madison, and editor of Entoma, was mistaken for a pheasant on a hunting trip just before Christmas last year with the resultant loss of one eye and a lingering, persistent sickness. This industry, which he has so often befriended, wishes Dr. Fisher a speedy recovery.

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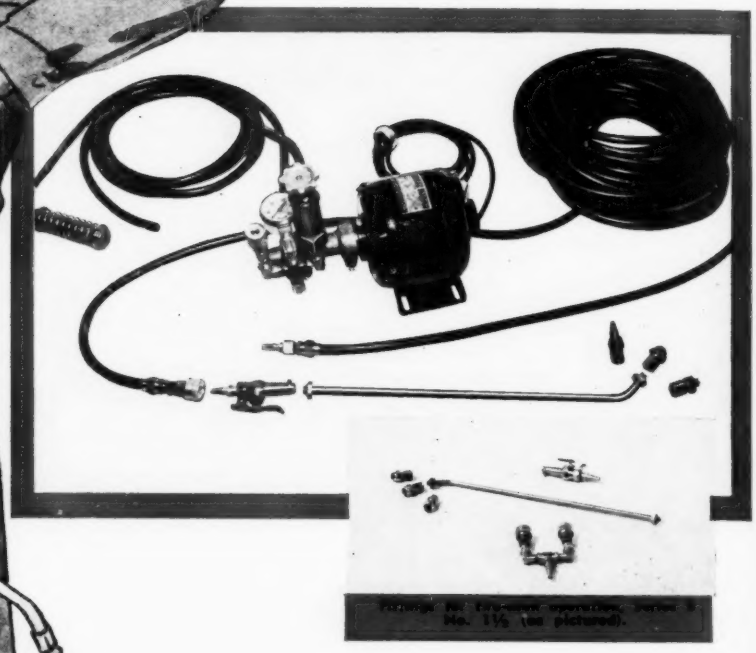

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